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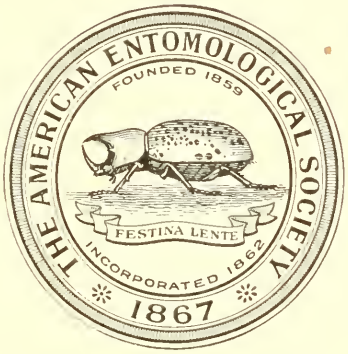

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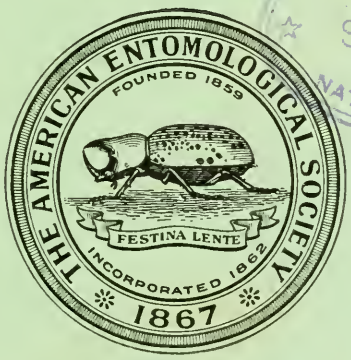

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TRANSACTIONS
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VOLUME XLVI

NEW OR LITTLE-KNOWN CRANE-FLIES FROM JAPAN
(TIPULIDAE, DIPTERA)

BY CHARLES P. ALEXANDER

Some extensive collections of crane-flies from various parts of Japan have been acquired by the writer during the past few years. The most important of these was collected by Mr. Ryoichi Takahashi in the vicinity of Tokio and in the mountainous sections of the province of Saitama, about fifty miles from Tokio. Other material discussed in the present paper was received from Dr. T. Miyake and Dr. Akio Nohira. The writer expresses his thanks to these gentlemen for this material. The types of the new species are preserved in the collection of the author, paratypes of several of the flies being placed in the cabinet of the American Entomological Society.

Family TIPULIDAE

Subfamily LIMNOBIINAE

Tribe *Limnobiini*

Genus **DICRANOMYIA** Stephens

Dicranomyia longipennis (Schummel)

1829. *Limnobia longipennis* Schummel, Beitr. zur Ent., i, p. 104, pl. i, fig. 2.

A female specimen from Meguro, Tokio, April 24, 1919, taken by Mr. Takahashi, vastly extends the known range of this fly, hitherto known only from Europe and North America.

Dicranomyia takahashii new species

General coloration reddish yellow, the pronotum and anterior part of the praescutum with a broad dark brown median stripe; antennae dark brownish black throughout; wings with *Sc* short, cell *1st* M_2 closed.

Male.—Length, 5.5 mm.; wing, 7.2 mm.

Female.—Length, 7 mm.; wing, 7 mm.

Rostrum slightly produced, deep reddish brown; palpi dark brown. Antennae dark brownish black throughout, the flagellar segments with long, conspicuous verticils. Head dark brown, sparsely gray pruinose, most evident on the front.

Pronotum shiny reddish yellow, dark brown above. Mesonotal praescutum reddish yellow with a conspicuous dark brown median stripe, which becomes obliterated beyond mid-length of the sclerite; remainder of the thorax reddish yellow, the pleura sparsely whitish yellow pollinose. Halteres moderately long, dark brown, the base of the stem pale. Legs with the coxae and trochanters dull yellow; femora brown, a little brighter basally; tibiae and tarsi brown. Wings with a grayish yellowish suffusion, the costal region more yellowish; stigma very indistinct, pale yellow; veins brown. Venation: *Sc* short, Sc_1 ending opposite or slightly beyond the origin of the sector; Sc_1 about equal to *r*; *Rs* about twice the length of the basal deflection of R_{4+5}; *r* rather long, at the extreme tip of R_1; cell *1st* M_2 closed, rather long, pentagonal; basal deflection of Cu_1 at or just beyond the fork of *M*.

Abdomen light brown, the hypopygium more yellowish.

Habitat.—Japan. Holotype, ♂, Tokio, May 22, 1919, (R. Takahashi). Allotopotype, ♀, May 26, 1919.

Dicranomyia submorio new species

General coloration shiny black, the anterior part of the vertex and the pleura silvery pruinose; fore femora brownish yellow, similar to the other femora; wings with a strong brownish tinge, the costal and basal regions yellow; Sc_1 very long, *Rs* and cell *1st* M_2 short; abdomen black, banded with reddish; male hypopygium with the dorsal pleural appendage a curved, chitinized arm which is acutely pointed at the tip.

Male.—Length, 5.8 mm.; wing, 6.6 mm.

Rostrum short, brown; palpi black. Antennae with the scapal segments brown, the flagellum black, the flagellar segments long-oval. Head black, the anterior part of the vertex silvery pruinose.

Mesonotum shiny black with a very sparse brownish pollen. Pleura covered with a silvery pruinosity. Halteres yellow, the knobs dark brown. Legs with the coxae black, the tips, especially those of the middle and hind coxae, brownish yellow; trochanters dull yellow; femora brownish yellow; tibiae yellowish brown, the terminal tarsal segments dark brown. Wings with a strong brownish suffusion, the costal region, the wing-base and a seam along vein *Cu* yellowish; stigma rounded oval, dark brown; indistinct and very narrow brown seams along the cord and at the origin of the sector; veins dark brown, *Sc* yellow. Venation: *Sc* short, ending opposite or slightly

before the origin of *Rs*; Sc_2 very far from the tip of Sc_1, the latter alone being longer than the sector; *Rs* rather short, about one-half longer than the basal deflection of R_{4+5}; cell *1st* M_2 closed, short, about equal to that portion of vein Cu_1 beyond it; basal deflection of Cu_1 at or just beyond the fork of *M*.

Abdominal tergites black, the caudal half of the segments reddish; sternites similar but with the black markings even more restricted; terminal abdominal segments and the hypopygium black. Male hypopygium with the ninth tergite gently concave across the posterior margin, the lateral angles not produced; ventral pleural appendage fleshy, tapering to the narrow, subacute apex; dorsal pleural appendage a curved, chitinized hook with the apex acute.

Habitat.—Japan. Holotype, ♂, Saitama, May 29, 1919, (R. Takahashi).

Dicranomyia pseudomorio new species

General coloration shiny black, the anterior part of the vertex and the pleura silvery pruinose; fore femora blackish, yellow at the base; wings narrow, with a strong brown tinge, Sc_1 long, about half the length of the long sector, cell *1st* M_2 narrow; abdomen black, the tergites indistinctly, the sternites distinctly, banded with reddish; male hypopygium with the dorsal pleural appendage a flattened pale arm that is expanded at the tip into a hatchet-shaped blade.

Male.—Length, 6.6 mm.; wing, 7 mm.

Rostrum reddish brown. Antennae dark brownish black throughout. The anterior part of the vertex brilliantly silvery.

Thorax and legs as in *D. submorio*, but the fore femora blackish except the bases, which are yellow; tibiae and tarsi blackish brown. Wings much narrower than in *D. submorio*, with a strong brownish tinge, the stigma more oval in outline and not so deeply colored. Venation: Sc_1 ending slightly beyond the origin of the sector, Sc_2 removed from the tip of Sc_1, the latter alone being less than half the length of the sector; *Rs* long, indistinctly spurred at the origin, more than twice the length of the basal deflection of R_{4+5}; cell *1st* M_2 closed, narrow, longer than Cu_1 beyond it.

Abdominal tergites deep black, the basal segments with the caudal margin indistinctly reddish; sternites similar but with almost the posterior half of the segments reddish. Male hypopygium black, conspicuously different in structure from that of *D. submorio*; the lateral angles of the ninth tergite are produced caudad into slender arms which bear a few short hairs at the tips; pleurites stout, the inner face produced into a conspicuous arm which is expanded into a head at its distal end; ventral pleural appendage stout, the inner face produced into a point, so the whole appendage suggests the head and beak of a bird, at the base of the beak-like portion is a slightly raised papilla which bears a long, hyaline peg-like organ; dorsal pleural appendage slender, flattened-cylindrical, slightly curved, at its outer end expanded into a hatchet-shaped blackened blade.

Habitat.—Japan. Holotype, ♂, Saitama, May 29, 1919, (R. Takahashi).

The present species bears a strong superficial resemblance to *D. submorio*, but the venation and male hypopygium are very distinct.

Genus **THRYPTICOMYIA** Skuse

Thrypticomyia arcuata new species

Antennae dark brownish black; thoracic dorsum pale brown without stripes, the pleura yellow; halteres black, the basal half of the stem yellow; legs with the tarsi white, except the extreme bases of the metatarsi; wings hyaline with conspicuous black veins, the wing-tip indistinctly darkened; inner end of cell *1st* M_2 arcuated, in a line with the inner end of cell R_3.

Male.—Length, about 5.5 mm.; wing, 6 mm.

Rostrum orange-yellow; palpi with the basal segment yellow, the terminal segments dark brown. Antennae rather long for this genus, dark brownish black, the scapal segments a little paler; flagellar segments long-oval with long, verticils arranged unilaterally. Head dark brownish black.

Pronotum yellowish. Mesonotum shiny light brown without distinct stripes, the lateral margins indistinctly more yellowish; remainder of the dorsum similar but more yellowish. Pleura light yellow. Halteres very long and slender, black, the basal half of the stem yellow. Legs with the coxae and trochanters yellow; femora dark brown, the bases yellowish; tibiae dark brown, passing into black at the tips; tarsi white, the extreme bases of the metatarsi and the claws brown. Wings hyaline with the veins very conspicuous, black; stigma oval, brown; tip of the wing very indistinctly darkened. Venation: Sc_1 ending just beyond the origin of *Rs*, Sc_2 rather far from its tip, Sc_1 being a little longer than the basal deflection of Cu_1; basal deflections of R_{4+5} and M_{1+2} strongly arcuated, so the inner ends of cells R_3 and *1st* M_2 are about on a level and far proximad of the inner end of cell R_5; basal deflection of Cu_1 beyond mid-length of the long cell *1st* M_2.

Abdomen elongate, the tergites dark brown, the sternites paler brown.

Habitat.—Japan. Holotype, ♂, Tokio, May 9, 1919, (R. Takahashi).

Genus **RHIPIDIA** Meigen

Rhipidia pulchra septentrionis Alexander

1913. *Rhipidia pulchra septentrionis* Alexander, Can. Ent., xlv, pp. 206, 207.

This northern variety of *Rhipidia pulchra* de Meijere was originally based on two alcoholic females. A male is now available and may be described as follows:

Allotype—♂, Meguro, Tokio, Japan, April 21, 1919, (R. Takahashi).

Male.—Length, about 6 mm.; wing, 6 mm.

Very similar to the female. Antennal segments very broad but scarcely pectinate, each flagellar segment with a distinct but short pedicel. Male hypopygium pale brownish yellow, the dorsal pleural appendage heavily chitinized, black, acutely pointed; gonapophyses similarly chitinized, slightly curved.

This variety is very close to the typical form and more material of both will be needed to show their true relationship. *R. spadicithorax* (Edwards) of the Seychelles Islands also belongs to this group of species, but is abundantly distinct from either of the Eastern forms.

Genus **LIMNOBIA** Meigen

Limnobia subnubeculosa new species

Antennae black; mesonotum reddish brown with three dark brown stripes, scutellum and postnotum dark; femora with two black bands; wings yellowish gray, clouded with brownish gray; abdominal tergites banded with brown and yellow.

Male.—Length, 7.6–7.9 mm.; wing, 9.6–10 mm.

Female.—Length, 7.4–9 mm.; wing, 8.8–10.4 mm.

Rostrum and palpi black. Antennae black, the first flagellar segment indistinctly yellowish at base, the flagellar segments with a dense white pubescence. Head dark grayish black.

Pronotum black. Mesonotum shiny reddish brown, with three dark brown stripes, the median stripe less distinct than the lateral stripes and becoming obliterated some distance before the suture; lateral stripes continued back upon the scutal lobes; a brownish spot is placed on the lateral margin of the praescutum opposite the anterior end of the lateral stripe; scutellum and postnotum dark, shiny. Pleura largely dark brown, a little more yellowish beneath the wing-root. Halteres yellow, the knobs brown, the tips again yellow. Legs with the fore coxae black, the other coxae yellowish; trochanters yellow; femora yellow with two dark brown bands, one apical, the second on the apical third of the segment, the two bands enclosing a subequal yellow band; in some specimens there is a very indistinct third band near mid-length of the femur; tibiae and tarsi brownish yellow, the apical tarsal segments brown. Wings pale yellowish gray, the costal region and the base of the wings more yellowish; brown spots at the tip of Sc_1 and the origin of Rs; extensive brownish gray clouds present on all the veins and covering most of the wing-surface. Venation: r far before the tip of R_1; basal deflection of Cu_1 variable in position, at, slightly beyond or even some distance before the fork of M.

Abdominal tergites shiny dark brown, the caudal margins of the segments yellowish; sternites dull brownish yellow, the basal portions of the segments darker, the basal sternites clearer yellow. Male hypopygium with a single pleural appendage which is strongly narrowed at the tip; gonapophyses in the form of two, pale, slightly divergent horns.

Habitat.—Japan. Holotype, ♂, Saitama, May 29, 1919, (R. Takahashi). Allotopotype, ♀, May 29, 1919. Paratopotypes, 8 ♂ ♀, May 29 to 31, 1919.

Limnobia subnubeculosa is related to *L. nubeculosa* Meigen (Europe) and *L. sciophila* Osten Sacken (Western North America).

Genus **LIBNOTES** Westwood

Libnotes regina new species

Large (wing of female over 20 mm.); antennal flagellum pale; general coloration yellowish brown,the thoracic pleura yellow with narrow brown longitudinal stripes; femora and tibiae tipped with dark brown; wings uniformly yellow, sparsely spotted along the veins with brown.

Female.—Length, 17 mm.; wing, 21.5 mm.

Rostrum rather slender, reddish brown; mouthparts brown; palpi dark brown. Antennae with the scape dark brown; basal flagellar segments greenish yellow, the terminal segments darkened; first scapal segment a little longer than the rostrum. Head reddish brown, the vertex between the eyes reduced to a narrow linear strip.

Neck distinct. Pronotum reddish brown. Mesonotal praescutum reddish brown, darker brown medially and laterally; beyond mid-length of the praescutum is a square, median, gray area, bordered on the sides and in front by a dark brown line; scutum broadly gray medially, the lobes largely dark brown; scutellum and postnotum pale gray, the latter with the sides dark brown. Pleura yellow with strong green tints, with three narrow, dark brown longitudinal stripes, the first on the sides of the pronotum, ending above the fore coxa; the second, dorsal stripe beginning immediately dorsad of the caudal end of the first stripe, extending to beyond the wing-root; the third stripe is on the sternopleura, ending above the posterior coxa, interrupted above the mesocoxa. Halteres yellow, the knobs brown. Legs with the coxae pale, the posterior coxae strongly greenish in freshly-killed specimens; trochanters yellow; femora yellow, the tips broadly brownish black, the extreme tip on the ventral face paler brown; tibiae dull yellow, the tips narrowly dark brown; first two tarsal segments brownish yellow, the tips narrowly darkened; remainder of the tarsi dark brown. Wings with a strong yellow tinge that is practically uniform over the wing-surface; dark brown spots and dots on the veins, larger spots at the tip of Sc_1, origin of *Rs*, tip of R_1, *r*, along the cord and at the tips of veins Cu_1 and *2nd A*; small brown dots on most of the longitudinal veins; a narrow brown seam in cell Cu_1 parallel to the wing-margin. Venation: *Rs* slightly spurred near its origin; *m* about two-fifths the length of cell *1st* M_2.

Abdomen dull yellow, the tergites very indistinctly darker medially; first tergite with a large triangular dark brown area on either side; lateral margins of the tergites indistinctly dark brown; sternites with a dark brown lateral spot near the base of the segments, larger and more distinct on the terminal segments. Terebra of the ovipositor rather short.

Habitat.—Japan. Holotype, ♀, Tokio, May 12, 1919, (R. Takahashi).

The collector states that this species is very rare. *Libnotes regina* is a beautiful species, much larger than the brown *L. undulata* Matsumura, but smaller than the even more elegant *L. regalis* Edwards of Formosa.

Tribe *Antochini*

Genus **RHAMPHIDIA** Meigen

Rhamphidia obliterata new species

Rostrum longer than the head; antennae of the male long, extending beyond the base of the abdomen; legs yellow, the tarsi darkened; wings with the stigma dark brown, the wing-tip faintly darkened; basal deflection of R_{4+5} very short or obliterated.

Male.—Length, about 7 mm.; wing, 8 mm.

Rostrum elongate much longer than the head, dark brown above, paler beneath; palpi dark brown. Antennae of the male very long for this genus of flies, if bent backward extending beyond the base of the abdomen; antennae dark brown, the first flagellar segment and the base of the second more yellowish; second scapal segment pale brown; flagellar segments long-cylindrical, clothed with a conspicuous, erect white pubescence; verticils subbasal, inconspicuous, scarcely exceeding the pubescence. Head brown, the vertex rather narrow.

Pronotal scutum blackish, the scutellum yellow, dusky medially. Mesonotal praescutum pale brown with three very indistinct darker brown stripes that are entirely confluent behind; pseudosutural foveae shiny, pale chestnut-brown; scutal lobes brown, the median area yellow; scutellum and postnotum dark plumbeous brown. Pleura yellowish brown. Halteres yellowish, the knobs very indistinctly darker. Legs with the coxae brownish yellow; trochanters and femora yellow; tibiae brownish yellow; tarsi brown. Wings with a faint grayish tinge, the costal and subcostal cells more yellowish; stigma long-oval, dark brown; wing-tip faintly darkened; very indistinct darker clouds at the origin and tip of the sector; veins brown. Venation: *Rs* moderately elongated, strongly angulated at origin; basal deflection of R_{4+5} very short or even entirely obliterated, in the latter case veins R_{2+3} and R_{4+5} appearing to arise directly from the end of the sector; vein R_{2+3} almost straight, not bending strongly toward R_1 as in most species of the genus, at the wing-margin vein R_{2+3} being nearly equidistant from veins R_1 and R_{4+5}; cell *1st* M_2 long-rectangular; basal deflection of Cu_1 at about one-third the length of cell *1st* M_2.

Abdomen dark brown. Male hypopygium rather elongated for this genus, the pleurites, especially, being lengthened; ninth tergite with the caudal margin gently emarginate, the lateral angles slightly produced.

Habitat.—Japan. Holotype, ♂, Saitama, May 29, 1919, (R. Takahashi).

Rhamphidia nipponensis Alexander

1913. *Rhamphidia nipponensis* Alexander, Can. Ent., xlv, pp. 207 and 209.

The original description of this species was based on a single female specimen. In the present collection both sexes are represented and the male is described herewith. The species is close to the form described in this article as *R. brevioricornis* but differs in the longer antennae, the slightly different male genitalia and the usually paler coloration.

Male.—Length, 7 mm.; wing, 7.6 mm.

Rostrum of the male longer than in the female. Antennae moderately long for this genus of flies, in the male sex being nearly three times the length of the rostrum; flagellar segments long-cylindrical, the first flagellar segment nearly twice as long as the second scapal segment and subequal to the second and third flagellar segments.

Thorax pale brownish yellow, the median praescutal stripe dark brown, the lateral stripes much less distinct; scutal lobes very dark brown; postnotum usually pale with a dark brown median line, in some cases the entire median area of the postnotum being suffused.

Abdomen dark brown above, the sternites pale; hypopygium brownish yellow. Male hypopygium with the outer pleural appendage short, about two-thirds the length of the inner appendage, the tip produced into a slightly curved point, before the apex on the outer or caudal face with a very blunt, appressed tubercle.

Allotype.—♂, Tokio, May 15, 1919, (R. Takahashi). Other specimens of both sexes, Meguro, Tokio, April 25 to May 20, 1919.

Rhamphidia brevioricornis new species

Antennae short, in the male sex being only about twice the length of the rostrum; general coloration dark brownish gray, the mesonotum with dark brown markings; male hypopygium with a conspicuous subapical spine on the outer face of the outer pleural appendage.

Male.—Length, 7.5–8 mm.; wing, 8.2–8.8 mm.

Female.—Length, 8.6 mm.; wing, 7.8 mm.

Rostrum much exceeding the head, black, the ventral surface paler; palpi black. Antennae dark brownish black throughout, shorter than in *R. nipponensis*, in the male being about twice the length of the rostrum; first flagellar segment short-oval, no longer than the second scapal segment, the second and third segments short-oval, the succeeding segments gradually longer; verticils of the intermediate segments about equal to the segments which bear them. Head dark gray, the vertex with a brownish longitudinal stripe; vertex between the eyes considerably narrowed.

Mesonotum dark brownish gray, the praescutum with a broad, dark brown, median stripe whose sides are parallel-sided; lateral stripes much narrower and less distinct; remainder of the mesonotum blackish. Pleura gray. Halteres yellow, the knobs a little darker. Legs with the coxae blackish; trochanters dull brownish yellow; remainder of the legs dark brown. Wings with a faint gray tinge, the stigma and costal region faintly yellow, the costal veins brown. Venation as in *R. nipponensis*.

Abdomen dark brownish black, the hypopygium a little paler brown. Male hypopygium similar to that of *R. nipponensis*, but the subapical spine on the outer face of the outer pleural appendage much longer and very conspicuous.

In some specimens, the ground color of the mesonotum is buffy-brown instead of brownish gray.

Habitat.—Japan. Holotype, ♂, Meguro, Tokio, April 29, 1919, (R. Takahashi). Allotopotype, ♀, May 5, 1919. Paratopotypes, 7 ♂ ♀, April 29 to May 20, 1919.

Tribe *Eriopterini*

Genus **ERIOPTERA** Meigen

Erioptera (Acyphona) incongruens Alexander

1913. *Erioptera (Acyphona) incongruens* Alexander, Can. Ent., xlv, pp. 288, 289.

The original description of this species was based on a unique alcoholic male which was badly broken. A female specimen is now available and may be described.

Female.—Length, 6 mm.; wing, 6.5 mm.

This interesting fly differs considerably from the same sex of *E. (A.) asymmetrica* Alexander. Legs with only the fore femora biannulate with dark brown and the rings much narrower than the yellow area between them; middle and hind legs with only the subapical brown rings. The wing pattern is much more ocellate than in *asymmetrica*, ocelliform markings occur at the origin of *Rs*, at Sc_1, tip of Sc_1 and *r*, tips of R_1 and all the other longitudinal veins; at the end of *Rs* and on *r-m* and as a broken subterminal band across the wing beyond the distal end of cell *1st* M_2; in addition, almost all the cells of the wing have an abundance of small brown dots which are lacking only in the costal region; vein M_3 before *m* about as long as or slightly longer than the basal deflection of Cu_1.

Allotype, ♀, Meguro, Tokio, April 26, 1919, (R. Takahashi).

The collector states that this species is "very rare."

Genus **MOLOPHILUS** Curtis

Molophilus trifilatus new species

General coloration shiny black; legs with the trochanters and femoral bases yellowish; male hypopygium with three acicular spines, two being pleural appendages, one the penis-guard.

Male.—Length, 3.3–3.4 mm.; wing, 4.3–4.5 mm.

Female.—Length, 3.8–4.1 mm.; wing, 5–5.6 mm.

Rostrum and palpi dark brownish black. Antennae black, short in both sexes. Head black.

Thorax shiny black, the praescutum laterad of the pseudosutural foveae a little paler. Halteres dark brown, the stem pale yellow. Legs with the coxae dark brownish black; trochanters dull yellow; remainder of the legs dark brown, the bases of the femora yellowish. Wings with a uniform pale gray tinge; veins dark brown, clothed with long brown hairs. Venation: *r* almost in alignment with the basal deflection of R_{4+5}; basal deflections of M_3 and Cu_1 about equal, a little shorter than the fusion of M_3 and Cu_1.

Abdomen black, covered with long, brownish yellow hairs. Male hypopygium with the pleural appendages projecting far caudad as two long, straight arms which are slightly curved before the acute tips; in addition, the penis-guard, pale yellow in color, projects to a nearly equal distance.

Habitat.—Japan. Holotype, ♀, Meguro, Tokio, April 28, 1919, (R. Takahashi). Allotopotype, ♂, April 24, 1919. Paratopotypes, 18 ♀ ♂, April 28 to May 12, 1919.

Molophilus trifilatus suggests the European *M. bifilatus* Verrall in the structure of the male hypopygium, but is easily told by the intense black color of the body.

Tribe *Limnophilini*

Genus **EPIPHRAGMA** Osten Sacken

Epiphragma subfascipennis new species

Antennae with the flagellum orange-yellow, the last three or four segments darkened; mesonotal praescutum with light gray stripes; halteres light yellow throughout; femora with a narrow brown annulus near the tip; wings fasciate with brown, fading into gray in the posterior wing-cells; cell *1st* M_2 small; abdominal tergites broadly margined caudally with gray.

Male.—Length, about 11.5 mm.; wing, 11.7 mm.

Female.—Length, about 12.5 mm.; wing, 13.8 mm.

Rostrum brown, the dorsal surface covered with a sparse yellow pollen; palpi dark brown. Antennae with the scapal segments dark brown; flagellum light orange-yellow with only the last three or four segments faintly darkened; antennae rather elongate for this genus of flies. Head velvety brown, the anterior part of the vertex marked with yellow pollen, encircling the antennal fossae, the slight vertical tubercle and along the inner margin of the eyes.

Pronotum dark brown. Mesonotum rich brown, more saturated at the humeral regions and across the cephalic margin of the sclerite; praescutal stripes yellowish gray, the median stripe split by a capillary brown line; remainder of the mesonotum light gray, the scutellum and the median area

of the scutum more yellowish gray. Pleura dark brown with an interrupted silvery pollen, giving a spotted appearance and a more or less distinct pleural stripe. Halteres yellow. Legs with the coxae brown, sparsely gray pruinose; trochanters dull yellow, margined caudally with brownish black; femora yellow, immediately before the tip with a brown annulus; tibiae brownish yellow; tarsi brownish yellow, the terminal segments brown. Wings hyaline with a fasciate pattern suggesting that in *E. fascipennis* (Say); basal band irregular, not connected with the middle band, brownish in the anterior cells of the wing, more grayish in the posterior cells, forming ocellate circles at the arculus and the origin of the sector; the middle and apical bands are connected with one another along veins R_{4+5} and M_{1+2}; the supernumerary cross vein in cell *C* is connected with the basal cross band; the marks at the ends of veins R_2, R_3, R_{4+5} and M_1 are all connected with one another at their proximal ends. Venation: cell R_2 deep, the veins not conspicuously divergent at the wing-margin; cell *1st* M_2 comparatively small; petiole of cell M_1 about as long as the cell, slightly arcuate.

Abdominal tergites brown, the caudal margins of the segments broadly and conspicuously gray pruinose; sternites brownish yellow. Male hypopygium with the lateral gonapophyses almost straight, not notably twisted at their tips.

Habitat.—Japan. Holotype, ♂, Saitama, May 30, 1919, (R. Takahashi). Allotopotype, ♀, May 31, 1919.

Epiphragma subinsignis new species

Antennae with the basal four or five segments of the flagellum orange-yellow; mesonotal praescutum reddish anteriorly, light gray behind; halteres yellow with a dark brown band at the base of the knob; legs yellow; wings with an irregular yellowish brown pattern; cell *1st* M_2 large, ample; abdominal tergites narrowly margined caudally with gray.

Male.—Length, about 11 mm.; wing, 11 mm.

Rostrum yellow; palpi brown. Antennae with the scape dark brown, the basal four or five flagellar segments orange-yellow, thence passing into brown; flagellar segments shorter than in this sex of *E. subfascipennis*. Head with a conspicuous yellowish pollen, the setiferous punctures conspicuous, dark brown; a large brownish area behind the antennal bases.

Pronotum dark brown medially, more grayish laterally. Mesonotal praescutum with about the anterior half light reddish, the posterior half gray; median praescutal stripe split by a brown capillary line; remainder of the mesonotum light gray, the scutellum yellowish gray. Pleura light gray, spotted with dark brown. Halteres light yellow, a dark brown band across the base of the knobs and the apical portions of the stem. Legs light yellow, the tarsal segments a little darkened. Wings broad, hyaline, with an irregular, clear-cut pattern of yellowish brown, narrowly margined with dark brown; this consists of a cross-band at the level of the origin of the sector, extending across the wing, enclosing a hyaline spot at the spur of the sector; two smaller spots nearer the base of the wing; a broad, irregular band along the cord

narrowly connected with the band just described along vein *M;* the supernumerary cross vein in cell *C* is usually isolated from the other markings; the small spots at the ends of veins R_2, R_{4+5}, M_{1+2} and M_3 are isolated. Venation: cell R_2 comparatively shallow, veins R_2 and R_3 diverging slightly at the wing-margin; cell *1st* M_2 large, ample; petiole of cell M_1 comparatively short.

Abdominal tergites reddish brown, the caudal margins very narrowly and indistinctly gray pruinose; sternites, especially the basal segments, yellow, narrowly margined laterally with dark brown. Male hypopygium with the lateral gonapophyses almost straight, the tips considerably twisted.

Habitat.—Japan. Holotype, ♂, Saitama, May 29, 1919, (R. Takahashi). Paratype, ♂, Mt. Takao, Musashi, May 15, 1913, (T. Miyake).

Genus **LIMNOPHILA** Macquart

Limnophila (Lasiomastix) flavella new species

General coloration brownish yellow, the tarsi brown; wings yellow, a small, shiny black spot at their extreme base; apical cells of the wings pubescent.

Male.—Length, 4–5.3 mm.; wing, 5.6–6.8 mm.

Female.—Length, 5.2 mm.; wing, 5.4 mm.

Rostrum and palpi reddish yellow. Antennae yellow, the apical half of the flagellum more infuscated; antennae moderately elongated, if bent backward, extending to beyond the wing-base. Head brownish yellow, the front, anterior part of the vertex and along the inner margin of the eyes whitish silvery.

Mesonotum brownish yellow, sparsely pollinose, without stripes. Pleura pale yellow, sparsely yellow pollinose. Halteres pale, the knobs indistinctly darker. Legs yellow, the tarsi, with the exception of the metatarsi, dark brown. Wings rather narrow, light yellow; veins pale brown; a small, shiny black spot at the root of the wing; a sparse pubescence in cells *2nd* R_1, R_2, R_3, R_5, M_1, M_2, M_3, Cu_1, and sometimes in the end of cell *1st A*. Venation: *r* far before the tip of R_1; *Rs* long; R_{2+3} longer than the basal deflection of R_{4+5}; *r-m* long, arcuated; petiole of cell M_1 about equal to the cell; basal deflection of Cu_1 before midlength of cell *1st* M_2.

Abdomen brownish yellow. Male hypopygium with the outer pleural appendage blackened at the tip, which is split into two short teeth; inner pleural appendage pale, bifid, the outer or caudal arm about four times the length of the inner arm, slightly enlarged distally; inner arm slender, bearing hairs at the apex; penis-guard strongly arcuate beyond mid length. Ovipositor with the valves very elongate, as in the closely allied *L.* (*L.*) *pilifer* Alexander, from Japan.

Habitat.—Japan. Holotype, ♂, Tokio, May 12, 1919, (R. Takahashi). Allotopotype, ♀, May 5, 1919. Paratopotypes, 1 ♂, 2 ♀, May 5 to 12, 1919.

A male from Saitama, May 29, 1919, collected by Mr. Takahashi, appears to be a variety of this species. It is equal in size to the larger specimens whose measurements are given above, differing in the darker, more reddish color, the broader wings with the cells, especially cell *1st* M_2, correspondingly widened and with the cord distinctly seamed with darker. This form may be known as *Limnophila flavella saitamae* new subspecies.

Limnophila flavella, *L. pilifer* Alexander and *L. punctum* (Meigen) of Europe form a group of closely related species, which are distinguished from the typical American species of *Lasiomastix* by the short antennæ in the male sex.

Limnophila (Eulimnophila) tokionis new species

Antennae of the male sex elongated; general coloration shiny reddish brown, the thoracic pleura reddish yellow; wings brownish gray, the stigma indistinct; cell M_1 present.

Male.—Length, 6.5–7 mm.; wing, 7.8–8.7 mm.

Female.—Length, 11–11.8 mm.; wing, 9.8–10.8 mm.

Rostrum reddish brown; palpi dark brown. Antennae dark brown; in the male sex elongated, more than one-half the length of the body, the flagellar segments clothed with a long, erect pubescence. Head dark brown, with a sparse plumbeous bloom.

Pronotum reddish, the scutum dark brown medially. Mesonotal praescutum reddish, the disk more brownish, highly polished; scutum with the lobes reddish brown, the median area more yellowish; scutellum and base of the postnotum lead-color. Pleura reddish yellow. Halteres dull yellow, the knobs darker, brown. Legs with the coxae shiny yellow; trochanters dull yellow; remainder of the legs dark brown, only the femoral bases brighter. Wings brownish gray, the stigma very indistinct, of a slightly darker brown than the remainder of the wings; veins dark brown. Venation: Sc_2 long, at the tip of Sc_1, *r* far from the tip of R_1 and connecting with R_2 near its origin; cell M_1 present.

Abdominal tergites dark brown, the mid-dorsal region even darker; sternites yellowish with an interrupted dark longitudinal stripe, which is sometimes obsolete, especially in the females. Male hypopygium with the outer pleural appendage subchitinized, terminating in a long, curved hook, immediately beneath which are a number of minute denticles; inner pleural appendage fleshy, tapering gradually to the blunt apex which is tipped with a single powerful bristle.

Habitat.—Japan. Holotype, ♂, Tokio, April 28, 1919, (R. Takahashi). Allotopotype, ♀, May 27, 1919. Paratopotypes, 3 ♂, 2 ♀, April 24 to May 15, 1919.

Tribe *Hexatomini*

Genus **ERIOCERA** Macquart

Eriocera longifurca new species

General coloration black, dusted with light gray; mesonotal praescutum with three black stripes; legs black; wings yellowish, the cross-veins heavily margined with brown; ovipositor of the female with the tergal valves long and straight, the sternal valves inconspicuous.

Male.—Length, about 11 mm.; wing, 12.5 mm.

Female.—Length, 17 mm.; wing, 13.2 mm.

Rostrum and palpi black. Antennae short in both sexes, black. Head gray pruinose.

Mesonotum light gray pruinose, the praescutum with three blackish stripes, the median stripe broad in front, rapidly narrowed behind and becoming obliterated before the suture, indistinctly split by a capillary pale marking; lateral stripes narrow; scutum gray, each lobe with two black markings; scutellum and postnotum gray. Pleura gray. Halteres very short, the stem pale, darker at the extreme base, the knobs brown. Legs with the coxae gray pruinose; remainder of the legs black. Wings with a faint yellow tinge, the costal and subcostal cells more saturated; stigma small, oval, dark brown; broad brown seams at the origin of the sector, along the cord, outer end of cell *1st* M_2, apex of the wing and along veins *Cu* and *2nd A;* veins dark brown, *Sc* yellow. Venation: *r* inserted at about mid length of vein R_2, R_{2+3} very short, about one-half longer than *r-m;* cell *1st* M_2 long and narrow, longer than the veins issuing from it; basal deflection of Cu_1 before mid-length of cell *1st* M_2.

Abdomen black, sparsely gray pruinose, the posterior margins of the segments narrowly pale, more distinct on the sternites of the female. Male hypopygium not conspicuously enlarged. Ovipositor with the tergal valves long and straight, lying parallel to one another, transverse, blackened; sternal valves very short, not projecting beyond the base of the tergal valves; ninth tergite opaque, dusted with gray pollen.

Habitat.—Japan. Holotype, ♂, Saitama, May 31, 1919, (R. Takahashi). Allotopotype, ♀.

Tribe *Pedicinii*

Genus **TRICYPHONA** Zetterstedt

Tricyphona kuwanai Alexander

1913. *Tricyphona kuwanai* Alexander, Can. Ent., xlv, pp. 318, 319.

The male sex of this bizarre fly has not been described. It may be distinguished from the female by the following characters:

Allotype.—♂, Meguro, Tokio, Japan, April 14, 1919, (R. Takahashi).

Male.—Length, 12.5 mm.; wing, 13.4 mm.

Antennae very small, not greatly exceeding the head. Head sparsely gray pruinose. Cell *1st* M_2 is sometimes closed by the presence of a medial cross-vein which may be present in one wing and lacking in the other of the same individual; when present it lies transversely across the wing, connecting M_{1+2} with M_3.

Male hypopygium with the pleurites stout; pleural appendages two in number, the outer appendage short and rounded, the surface covered with numerous stout bristles and with three long setae; inner pleural appendage with the inner face produced into a long, slender arm, the apex of which bears a few long setae, the caudal face set with about a dozen powerful black spines. Gonapophyses flattened, narrowed to the beak-like apex.

Tricyphona trispinosa new species

Similar to *T. kuwanai;* size smaller, wing of the male under 11 mm.; wings without a row of costal black dots; a dusky seam along the cord and another extending obliquely across the wing-tip from *r* to the end of vein M_3, *m* present, oblique in position; inner pleural appendage of the male hypopygium with but three spines.

Male.—Length, about 9.5 mm.; wing, 10.8 mm.

Generally similar to *Tricyphona kuwanai*, differing as follows: The size is smaller, but the general coloration of the body and the peculiar pattern of the mesonotum is almost the same in the two species. Wings with the yellow subcostal band paler yellow, broader and including more of the costal cell, the remainder of the costal cell unicolorous, not spotted with black as in *kuwanai;* the brown band which begins at *r* and runs obliquely across the wing, in the present species continues across the fork of M_{1+2} and attains the wing-margin at the end of vein M_3; the *m* cross-vein is present, very oblique in position and lying far out toward the tip of the wing, occupying the path of the dusky band just described; a broad dusky seam along the cord, extending from *r-m* to the fork of Cu. Male hypopygium generally similar to *T. kuwanai*, but the inner pleural appendage with but few (three in the type) chitinized spines.

Habitat.—Japan. Holotype, ♂, without exact locality or date, possibly Kioto (Akio Nohiro, collector's number 28).

Subfamily Cylindrotominae

Genus **LIOGMA** Osten Sacken

Liogma kuwanai Alexander

1913. *Liogma kuwanai* Alexander, Can. Ent., xlv, pp. 321, 322.

The female sex of *Liogma kuwanai* has not been described.

Allotype.—♀, Meguro, Tokio, Japan, April 8, 1919, (R. Takahashi).

Female.—Length, about 12 mm.; wing, 11.5 mm.

The female sex differs from the male as follows:

Antennae shorter with the flagellar segments less distinctly serrate. Abdomen shorter and stouter, the distal segments more widened. Ovipositor with the valves rather long for a member of the Cylindrotominae but still fleshy and pubescent.

The head and thorax, in both sexes of the species, are dull gray pruinose, conspicuously different from the shiny black coloration of the other species of the genus. The praescutal interspaces are vermiculately pitted, producing a rugulose effect similar to that of the vertex.

Subfamily Tipulinae

Tribe *Tipulini*

Genus **TIPULA** Linnaeus

Tipula naviculifer new species

General coloration gray, the mesonotal praescutum with four dark brown stripes; antennae unicolorous; legs black, the femoral bases yellow; wings light yellow with a sparse brown cross-banded pattern; male hypopygium with a conspicuous boat-like appendage on the posterior margin of the eighth sternite.

Male.—Length, about 18 mm.; wing, 22.5 mm.

Frontal prolongation of the head light gray; nasus slender; palpi dark brown, the terminal segment passing into yellowish brown. Antennae with the scapal segments dull yellow; flagellum dark brownish black; antennae of moderate length, the flagellar segments subcylindrical, the basal enlargement not conspicuous. Head light gray, the anterior part of the vertex faintly tinged with reddish; a very indistinct dark brown median line.

Mesonotal praescutum tawny yellow, with four very distinct dark brown stripes, the intermediate pair separated from one another by a narrow line of the ground color; lateral margins and the humeral region a little more grayish; scutum brownish gray; scutellum and postnotum dull gray with a distinct black, interrupted median stripe on both sclerites. Pleura clear blue-gray, the dorso-pleural membranes dull buffy yellow. Halteres dull yellow, the knobs blackish, tipped with yellow. Legs with the coxae gray; trochanters dull yellow; remainder of the legs black with a little less than the basal half of the femora yellowish; legs long and slender, the metatarsi longer than the tibiae. Wings with a faint yellow tinge, much more saturated in the costal and subcostal cells and at the wing-base; stigma bicolorous, dark brown, with a large yellow blotch at the proximal-cephalic end; sparse brown markings at the origin of *Rs;* at the tip of *Rs;* the fork of *Cu;* paler grayish clouds near the wing-tip in cell R_2; an interrupted band across the wing extending from the origin of *Rs* to the caudal margin of the wing in the *1st Anal* cell; veins dark brown. Venation: R_2 persistent; cell R_2 broad; petiole of cell M_1 very short.

Abdominal tergites yellow with a very broad black median stripe that broadens out behind, on segments five to nine including the entire segments; caudal margins of segments two to four indistinctly pale; sternites yellow, on the fifth and succeeding segments passing into blackish; the boat-shaped appendage on the eighth sternite yellow. The abdominal segments before the hypopygium are very short and crowded, tergites six to eight being very narrow; male hypopygium moderately incrassated; ninth tergite ending in two very broad, flattened lobes, their caudal margins subtruncate, the lobes separated from one another by a deep narrow split; eighth sternite produced into a conspicuous, arcuate, boat-shaped appendage which is conspicuously fringed with yellow hairs.

Habitat.—Japan. Holotype, ♂, Saitama, May 29, 1919, (R. Takahashi).

Tipula trupheoneura new species

General coloration light gray; nasus bifid at apex; antennae dark brown, the second scapal segment yellow; wings hyaline, cross-banded with brown; tip of vein R_2 obliterated; abdomen yellowish at the base, the remaining segments darker, the sternites heavily pruinose.

Female.—Length, about 22 mm.; wing, 18.5 mm.

Frontal prolongation of the head rather long, dark gray; nasus very broad and slightly but distinctly bifid at its apex; mouthparts large; palpi dark brown, the incisures pale. Antennae with the first scapal segment elongate, dark brown, sparsely dusted with gray, the ventral face and apex yellowish; second scapal segment bright yellow; remainder of the antennae dark brown, the flagellar segments in this sex cylindrical. Head gray, very indistinctly infuscated on the vertex.

Pronotum gray with three darker markings. Mesonotal praescutum gray with four brown stripes, the intermediate pair not attaining the suture and separated from one another by a very narrow gray line; lateral stripes indistinctly bisected behind; each scutal lobe with two brown markings; remainder of the mesonotum light blue-gray with a very delicate brownish median line extending from the scutum to the postnotum. Pleura clear blue-gray. Halteres yellow, the knobs dark brown. Legs with the coxae blue-gray; trochanters brownish yellow; femora reddish yellow, the apical third (hind legs) or half (fore legs) dark brown; tibiae brown, the tips broadly blackened; tarsi black. Wings whitish hyaline, the costal and subcostal cells and the wing-root bright yellowish; stigma dark brown; a heavy brown cross-banded pattern including the wing-apex in the outer ends of cells R_2, R_3, R_5 and all of M_1 and *2nd* M_2, except a pale spot in the base of the latter; a broad band along the cord from the dark brown stigma; a broad, somewhat paler band across the middle of cells *R*, *M*, *Cu* and the end of *1st A*, *2nd Anal* cell and the base of the *1st Anal* cell similarly darkened; the broad hyaline cross-band beyond the stigma is complete, including practically all of cell *1st* M_2 and extending clear across the wing; veins dark brown, *Sc* and *R* yellow. Venation: tip of R_1 atrophied beyond *r;* the strong macrotrichiae of R_1 con-

tinued across *r;* tip of R_2 atrophied, leaving only a slight spur beyond *r;* petiole of cell M_1 short; *m-cu* distinct.

Abdomen with the basal tergites gray; tergite two and the base of three yellow, dark brown medially; remaining tergites dull black, the caudal margin of the segments narrowly pale, the posterior lateral margins broadly silvery pruinose; basal sternite blackened apically; second sternite and the base of the third yellowish; segments four to eight pale brown, with a broad dark median stripe which is almost hidden by a heavy silvery pollen that covers the segments. Ovipositor with the dorsal shield shiny black, only the apex paler; dorsal valves of the ovipositor straight, slender, greatly exceeding the short sternal valves.

Habitat.—Japan. Holotype, ♀, Saitama, May 31, 1919, (R. Takahashi).

Tipula serricauda Alexander

1914. *Tipula serricauda* Alexander, Can. Ent., xlvi, pp. 237, 238.

The original description of the present species was based on alcoholic females. A male *Tipula* is at hand which is evidently this sex of *serricauda* and the specimen is herewith made the allotype.

Allotype.—♂, Meguro, Tokio, Japan, May 10, 1919, (R. Takahashi).

Male.—Length, 15.5 mm.; wing, 20.5 mm.

Similar to the female sex, differing as follows:

Antennae short, scarcely longer than in the female. Abdomen dark reddish brown, the terminal segments blackish. Male hypopygium with the ninth tergite short, deeply impressed medially; ninth sternite with the caudal margin trifid; eight sternite unarmed.

Tipula serridens new species

General coloration light gray, the praescutum with four darker gray stripes which are margined with dark brown; antennal flagellum unicolorous; wings subhyaline, banded with brown; ovipositor with the tergal valves powerful, transverse, the outer margin serrate, the sternal valves subatrophied.

Female.—Length, about 21 mm.; wing, 17 mm.

Frontal prolongation of the head light gray; nasus short and stout; palpi dark brown. Antennae short, the first segment dark basally, the apex dull yellow; second segment dull yellow; first flagellar segment pale brown at the base, the remainder of the antennae dark brown. Head light ash-gray with a very indistinct, delicate, brown median line on the vertex; vertical tubercle low but evident.

Mesonotal praescutum light ash-gray, with four darker gray stripes which are margined with dark brown, the intermediate stripes narrowed behind and becoming obsolete before the suture; lateral stripes broad and with the brown margins very distinct; scutum light ash gray, the lobes with two darker

gray areas, the more cephalic of which are margined with brown; scutellum and postnotum light gray with a very indistinct brown median line. Pleura clear blue-gray. Halteres dull yellow, the knobs scarcely darkened. Legs with the coxae gray; trochanters dull yellow, the posterior trochanters faintly pruinose; femora brownish yellow with a broad darker brown subapical ring, the extreme tips very slightly paler; tibiae dull brownish yellow, tipped with brown; tarsi dark brown, the bases of the metatarsi brownish yellow. Wings whitish subhyaline, with a pale brown pattern; cells *C*, *Sc* and the wing-base strongly yellow; stigma oval, dark brown; wing apex darkened, including the end of cell R_2, the apical half of R_3, all except the base of R_5, all of M_1 and *2nd* M_2 and the ends of *1st* M_2 and M_4; darker brown marks at the origin and tip of *Rs* and along Cu_1 and Cu_2; faint brownish gray clouds along the cord, across the wing at about mid-length of the basal cells, including about all of cell *R*; *2nd Anal* cell similar; a large hyaline spot near the end of cell *M*. Venation: cell *1st* M_2 long and narrow, pentagonal; petiole of cell M_1 short; *m-cu* punctiform.

Abdominal tergites with the first segment dull gray; the following segments reddish buff with three broad dark brown stripes, which become broadened out on the terminal segments to include all of segment seven and the posterior half of segment six; lateral margins of the segments pale; impressed basal areas pale brown, inconspicuous; sternites similar, the three basal segments reddish brown, the others dark brown with the caudal margin more reddish. Ovipositor of the *arctica* type, the tergal valves rather slender, the outer margin with acute, appressed teeth; sternal valves minute, subatrophied.

Habitat.—Japan. Holotype, ♀, Saitama, May 29, 1919, (R. Takahashi).

Tipula terebrina new species

General coloration gray, the mesonotum with four dark brown stripes, of which the lateral pair are paler than the intermediate pair; antennae indistinctly bicolorous; vertex with a dark brown median line; wings brownish gray, with a broad hyaline band beyond the stigma extending caudad and proximad through cell *1st* M_2.

Female.—Length, about 20 mm.; wing, 17.7 mm.

Frontal prolongation of the head reddish yellow, grayish medially above; nasus moderately slender; palpi with the first segment pale, the remaining segments brown. Antennae with the first segment dark, the second segment dull yellow; flagellar segments indistinctly bicolorous, the basal enlargment of the individual segments dark brown, the remainder slightly paler brown. Head gray, the vertex with a conspicuous dark brown median line which is narrowed to a point behind.

Pronotum gray, with a dark brown mark above; scutellum light yellow. Mesonotal praescutum gray with four dark brown stripes, the intermediate pair separated from one another by a somewhat narrower and paler brown stripe; lateral stripes pale, the lateral margin tending to be obliterated; scutum light gray with the lobes very indistinctly darker medially; scutellum testa-

ceous with an indistinct darker median line; postnotum pale, light gray pruinose. Pleura light gray. Halteres dull brownish yellow, the knobs darker brown. Legs with the coxae light gray pruinose; trochanters dull yellow, the posterior trochanters pruinose; femora brownish yellow, the tips broadly dark brown; tibiae yellowish brown; tarsi dark brown. Wings with a strong brownish gray tinge, the base of the wing and cell *C* dull yellow, cell *Sc* and the space immediately behind vein *Cu* brighter yellow; stigma dark brown; a broad hyaline band beyond the stigma extending from the costal margin through cell *1st* M_2, including the end of cell *2nd* R_1, the basal two-thirds of R_2, almost the basal half of cell R_3, about the basal third of R_5 and practically all of cell *1st* M_2; in addition to this, an obliterative spot in cell *1st* R_1, before the stigma, and indistinct pale areas in the end of cell *R* and the bases of cells *2nd* M_2 and M_4; veins dark brown. Venation: cell *1st* M_2 small, pentagonal.

Abdominal tergites yellowish brown laterally, with a broad dark brown median stripe that is interrupted basally by broad smooth gray bands, on each side of which are rectangular dark brown impressed areas, these located on segments two to seven; sternites generally similar, the basal segments pale buff, the apical segments more grayish; an interrupted brown median stripe on the intermediate sternites; the dark brown impressed areas are found on sternites three to seven. Ovipositor with a long, shiny, dorsal shield, the long, slender tergal valves lying transversely, their outer margin not serrated; sternal valves short and high, extending to about one-third the length of the tergal valves, their tips truncated. The structure of the ovipositor indicates the manner in which the highly specialized types found in the *arctica* group of the genus *Tipula* have been derived.

Habitat.—Japan. Holotype, ♀, Meguro, Tokio, April 28, 1919, (R. Takahashi).

Tipula dichroistigma new species

Mesonotum shiny black, the praescutal interspaces gray pruinose; antennae of the male elongated; pleura gray pruinose; wings yellowish gray, the tips conspicuously darkened; stigma bicolorous, the basal half yellow, the apical half dark brown.

Male.—Length, about 14 mm.; wing, 19.1 mm.

Female.—Length, about 19 mm.; wing, 18.8 mm.

Frontal prolongation of the head rather short, dull yellow, above light gray pruinose; nasus slender; palpi pale brownish yellow. Antennae of the male sex very long, if bent backward extending to near mid-length of the abdomen; first three segments yellow, remainder of the antennae black; in the female, the antennae are short, about the basal half yellowish, the terminal half of the flagellum brown; male antennae with short verticils on the inner face, long, secund verticils on the outer face of the segments. Head clear light gray.

Pronotum black, grayish pruinose. Mesonotal praescutum shiny black, the interspaces gray pruinose; remainder of the dorsum shiny black, the

scutum sparsely, the postnotum more heavily, pruinose. Pleura clear gray, the dorso-pleural membranes light yellow. Halteres slender, pale brown, the knobs a little darker. Legs with the coxae brownish yellow, gray pruinose; trochanters yellow; femora dull yellow, the tips broadly blackened; tibiae dark brown, the tips black; tarsi black. Wings with a faint yellowish gray tinge, the costal and subcostal cells and the wing-base more yellowish; stigma bicolorous, the proximal half light yellow, the distal half abruptly dark brown; wing-tip strongly infuscated, including cells R_2, R_3, R_5, M_1, *2nd* M_2 and the margin of M_4. Venation: tip of R_2 persistent; *m-cu* short but distinct.

Abdomen with the basal tergites reddish yellow, the male sex with the fourth and succeeding tergites darker, on the sixth to ninth tergites almost black with the caudal margins narrowly, the lateral margins more broadly pale; sternites with the eighth and ninth segments only black. In the female the dark coloration begins on about the third segment; dorsal shield of the ovipositor shiny black. Male hypopygium simple in structure, the ninth tergite flattened, shiny black, the caudal margin with a U-shaped incision, the lateral lobes thus formed rounded; eighth sternite practically unarmed. Ovipositor with the dorsal shield rather short, the sternal valves longer than the tergal valves, their tips in a position of rest almost attaining the tips of the tergal valves in a position of rest.

Habitat.—Japan. Holotype, ♂, Saitama, May 30, 1919, (R. Takahashi). Allotopotype, ♀, in copula with the type, pinned on the same pin.

Tipula saitamae new species

General coloration yellow; mesonotal praescutum yellowish gray with four darker gray stripes; antennae bicolorous; wings yellow, the costal region brighter; legs yellow, the tarsi brown.

Female.—Length, about 20 mm.; wing, 19.3 mm.

Frontal prolongation of the head dark gray, more brownish laterally and beneath; nasus long and slender; palpi dark brownish black. Antennae with the scape yellow, the first flagellar segment dark brown with the apical half yellowish; basal flagellar segments bicolorous, the terminal segments more uniformly colored; flagellar segments long-cylindrical, slender, the basal swelling distinct, with long verticils. Head yellowish gray, the vertex rather narrow between the eyes.

Pronotum conspicuous yellow. Mesonotal praescutum dull yellowish gray with four slightly darker gray stripes, the intermediate pair narrow, widely separated; lateral margins of the sclerite more yellowish; scutum similar, the lobes marked with darker gray; scutellum and postnotum with a strong, dull yellow pollen. Pleura dull yellow. Halteres slender, pale brown. Legs with the coxae dull yellowish buff; trochanters dull yellow; femora and tibiae brownish yellow, the tips not darkened; metatarsi similar, the tips dark brown; apical tarsal segments dark brown. Wings with a very strong yellow tinge, much brighter in the costal and subcostal cells; stigma brown; veins brown, *Sc*, *R* and *Cu* more yellowish; obliterative streak extending into the

base of cell M_4. Venation: cell R_2 narrowed at its base; cell *1st* M_2 short, pentagonal; *m-cu* obliterated.

Abdomianl segments brownish yellow, segments seven and eight dark brown. Ovipositor with the tergal valves destroyed in the unique type, the sternal valves very dark colored at the base, rather slender and tapering to the acute tips.

Habitat.—Japan. Holotype, ♀, Saitama, May 30, 1919, (R. Takahashi).

Tipula insulicola Alexander

1914. *Tipula insulicola* Alexander, Can. Ent., xlvi, p. 211.

The original description of this species was based on a single alcoholic female from the vicinity of Tokio. In the present collection the male sex was represented by three specimens, one of which is here made the allotype.

Allotype.—♂, Meguro, Tokio, Japan, May 14, 1919, (R. Takahashi).

Male.—Length, 11.5 mm.; wing, 11.3 mm.; antenna, about 5 mm.

Similar to the female, differing as follows: Antennae elongate, if bent backward extending to beyond the base of the abdomen. Male hypopygium with the ninth tergite very high, the caudal margin produced into a long, compressed blade whose margins spread out laterally, this conspicuous median lobe being generally similar to the condition found in the Nearctic *T. annulicornis* Say, to which species the present insect is obviously allied; eighth sternite unarmed.

Genus **NEPHROTOMA** Meigen

Nephrotoma virgata (Coquillett)

1898. *Pachyrhina virgata* Coquillett, Proc. U. S. Nat. Mus., xxi, p. 306.
1914. *Pachyrhina virgata* Alexander, Can. Ent., xlvi, pp. 163, 164.
1916. *Pachyrhina virgata* Edwards, Ann. Mag. Nat. Hist., ser. 8, xviii, p. 266.
1917. *Pachyrhina virgata* Riedel, Arch. für Naturgesch., Abt. A, 5, p. 116.

Coquillett had but a single male specimen before him at the time of describing this species. The female sex may here be described.

Allotype.—♀, Meguro, Tokio, Japan, May 2, 1919, (R. Takahashi).

Length, about 15 mm.; wing, 14 mm.

Similar to the male, differing as follows:

Antennae much shorter, the base of the first flagellar segment pale. Abdomen with the dorsal median stripe very broad, on the second and third segments the base and apex of the segments narrowly pale, on segments four to seven with only the lateral and caudal margins pale. Valves of the ovipositor long and slender.

Nephrotoma virgata is apparently the commonest species of the genus in Japan. Specimens are before me from the following unrecorded stations:

Kioto, May 31 to July, (Akio Nohira).

Meguro, Tokio, April 24 to May 2, 1919, (R. Takahashi).

Saitama, May 29, 1919, (R. Takahashi).

Nephrotoma contrasta new species

General coloration yellow, the occiput with a large black spot; mesonotal praescutum with three black stripes; scutal lobes black; scutellum and postnotum mostly yellow; pleura heavily marked with black; wings yellow, a grayish brown seam at the end of *Rs* and another at the wing-tip; abdominal tergites trivittate with black.

Male.—Length, about 11 mm.; wing, 13.2 mm.

Female.—Length, 16.5 mm.; wing, 15.8 mm.

Frontal prolongation of the head yellow, the dorsum black; palpi pale brown, the terminal segments darker. Antennae with the first segment short, reddish brown; second segment dark brown; flagellum brownish black throughout, the segments rather deeply incised beyond the basal swelling. Front light yellow with a small brownish median spot; vertex orange-yellow, a small dark brown spot adjoining the inner margin of the eye; occiput with a very large rounded black mark which passes caudad to the cervical sclerites and ventrad upon the genae.

Pronotum light yellow, the sides broadly black. Mesonotal praescutum yellow with three black stripes, at the anterior end of the lateral stripes with an opaque velvety-black spot; suture black, this mark extended cephalad along the lateral margin of the praescutum, reaching to almost opposite the anterior end of the lateral stripes; scutum yellow, the lobes very extensively black; scutellum yellowish testaceous; postnotum yellow, the caudal margin with a pair of rounded black spots. Pleura yellow, heavily spotted with black, the largest marks on the mesosterna and mesopleura. Halteres brown, the knobs yellow. Legs with the fore coxae largely blackish on the outer face, the other coxae pale with a large basal black mark; trochanters dull yellow; femora brownish yellow, the tips indistinctly darker; in the female the femoral tips are broadly black, especially those of the fore legs where only the base of the segment is pale; tibiae pale brown, the tips broadly blackened; tarsi black. Wings with a strong yellowish tinge, the costal and subcostal cells yellow, the anal cells more grayish; stigma oval, dark brown; wing-tip and a cloud on the basal deflection of R_{4+5} and *r-m* grayish brown; veins dark brown. Venation: petiole of cell M_1 short or punctiform.

Abdominal tergites dull yellow with a broad black median stripe, on segments seven to nine suffusing the entire sclerites; sternites dull yellow. In the female, the dorsal median stripe is very broad and the lateral margins are distinctly blackish; sternites yellow with a dark brown median line, beginning on the second sternite as a capillary line which widens out behind, on the fifth and succeeding sclerites including most of the sternites. Hypopygium

black, the appendages pale brown. Ovipositor reddish yellow, short and stumpy, the tergal valves short-triangular; sternal valves short and blunt, the tips down-curved.

Habitat.—Japan. Holotype, ♂, Saitama, May 29, 1919, (R. Takahashi). Allotype, ♀, Meguro, Tokio, May 24, 1919, (R. Takahashi). Paratopotype, ♀, May 30, 1919.

Nephrotoma contrasta is readily told from the closely related *N. pullata* (Alexander) by the yellowish scutellum and postnotum, the punctiform or short-petiolate base of cell M_1 and other characters.

Nephrotoma palloris (Coquillett)

1898. *Pachyrhina palloris* Coquillett, Proc. U. S. Nat. Mus., xxi, p. 306.
1914. *Pachyrhina palloris* Alexander, Can. Ent., xlvi, pp. 159, 160.
1917. *Pachyrhina palloris* Riedel, Arch. für Naturgesch., Abt. A, 5, p. 116.
1918. *Pachyrhina palloris* Riedel, Ann. Mus. Nat. Hung., xvi, p. 320.

The male sex may be separated from the female as follows:

Allotype.—♂, Meguro, Tokio, Japan, May 26, 1919, (R. Takahashi).

Similar to the female sex, differing as follows:

Antennae rather elongate, if bent backward extending about to the base of the abdomen, the three basal segments yellow, the flagellum indistinctly bicolorous, the basal enlargement of the segments being a slightly darker brown than the pedicels.

Mesonotal praescutum with the median stripe indistinctly bifid, especially anteriorly. A small isolated opaque black spot opposite the anterior ends of the lateral stripes.

Abdominal tergites trivittate with black. Male hypopygium with the ninth tergite slightly tumid, the caudal margin very broadly emarginate; eighth sternite very gently emarginate.

Nephrotoma geminata new species

Antennae with the scape yellow, the flagellum dark brown; occipital area small, brown; mesonotum yellow, the praescutum with three black stripes, a faint isolated opaque spot opposite the anterior ends of the lateral stripes; scutellum and postnotum yellow, the latter with two large black spots on the caudal margin; wings pale brownish yellow, the stigma pale; abdomen reddish yellow, the tergites narrowly trivittate with black.

Male.—Length, about 11.5 mm.; wing, 10.3 mm.

Female.—Length, 14 mm.; wing, 11.6 mm.

Frontal prolongation of the head short, dull yellow, the dorso-median area dark brownish black; palpi pale brown. Antennae with the two basal segments yellow, the flagellum dark brown; flagellar segments in the male sex moderately elongated, feebly incised beyond the basal swelling. Front and anterior part of the vertex sulphur-yellow, remainder of the head orange-

yellow; a faint brown spot adjoining the inner margin of the eyes behind the antennal bases; occipital area small, brown, faintly shiny.

Pronotum yellow, the lateral portions only slightly darker. Mesonotal praescutum yellow with three shiny black stripes; laterad of the anterior ends of the lateral stripes a faint isolated opaque black spot; scutum with the lobes reddish black, the median area sulphur yellow; scutellum and postnotum mostly sulphur yellow, the latter with a pair of large rounded black spots along the caudal margin. Pleura yellow, the mesosternum between the fore and middle and middle and hind coxae and a spot before the halteres reddish brown or blackish. Halteres light brown, the ends of the knobs sulphur yellow. Legs with the coxæ and trochanters orange-yellow; femora reddish yellow, the tips indistinctly darker on the outer face; tibiae brownish yellow, the tips darkened; tarsi dark brown. Wings with a pale brownish yellow tinge, the costal and subcostal cells and the stigma a little more strongly yellow; veins dark brown. Venation: cell M_1 narrowly sessile; basal deflection of Cu_1 at the fork of M.

Abdomen reddish yellow, the tergites trivittate with black, the stripes very narrow, interrupted at the bases of the segments; segments of the abdomen clothed with conspicuous yellow hairs. Male hypopygium with the ninth tergite nearly as in *N. repanda,* outer pleural lobes convex, scoop-like, the tips broadly rounded. Ovipositor with the tergal valves straight, slender.

Habitat.—Japan. Holotype, ♂, Ichikawa, Chiba-ken, May 17, 1919, (R. Takahashi). Allotopotype, ♀.

Nephrotoma geminata is closely related to *N. palloris* (Coquillett), but differs considerably from this latter species in the details of structure and coloration.

Nephrotoma bifusca new species

Antennae with the basal segments pale; mesonotum yellow, the praescutum with three broad black stripes; scutellum and postnotum yellow, blackish laterally; pleura dull yellow, the mesosternum brownish black; wings pale yellow, with a brown band at the cord and the tip largely brown; abdominal tergites trivittate with black.

Female.—Length, about 18 mm.; wing, 13.2 mm.

Frontal prolongation of the head dull yellow, the dorsum shiny brown; nasus slender; palpi brown, the two intermediate segments dull yellow. Antennae with the basal segments dull yellow, on the fifth and succeeding segments with the basal enlargement brown producing an indistinct bicolorous effect. Head orange-yellow, the shiny occipital area small and pale brown.

Pronotum dull yellow. Mesonotal praescutum yellow with three very broad black stripes, the interspaces very narrow; an oval velvety black spot laterad of the anterior ends of the lateral stripes; ends of the suture velvety black; scutum black with only the narrow median area yellow; scutellum dull yellow, brownish black laterally; postnotum yellow medially, the lateral and posterior portions broadly black. Pleura dull yellow, the mesosternum

brownish black. Halteres dull yellow, the knobs brown with the tips yellowish. Legs yellow, the tibiae narrowly tipped with dark brown; tarsi dark brown. Wings pale yellowish subhyaline, cell *Sc* dark brown; stigma oval, dark brown; a distinct broad brown seam along the cord extending from the stigma along the cord, following the deflection of Cu_1 and Cu_2 to the margin; wing-tip broadly infuscated; longitudinal veins beyond the cord narrowly seamed with brown; veins dark brown. Venation: cell M_1 very short-petiolate.

Abdominal tergites yellow, with a broad black interrupted dorso-median stripe, each segment with a triangular black area with the narrow end directed cephalad; a shiny basal strip light yellow; lateral margins of the segments broadly black; eighth tergite entirely black; sternites dull yellow. Ovipositor with the valves rather long, acute.

Habitat.—Japan. Holotype, ♀, Kioto, May 27, 1914, (Akio Nohira).

In the pattern of the wings *Nephrotoma bifusca* resembles the European *N. quadrifaria* (Meigen).

A REVISION OF THE NEARCTIC SCIOMYZIDAE

(DIPTERA, ACALYPTRATAE)

BY E. T. CRESSON, JR.

In working over a collection of acalyptrate Diptera from Cornell University, Ithaca, New York, the material representing this family was found to be quite extensive and possessed a number of new or little known species, so that a rather serious study of the family was undertaken. Through the kindness of Mr. Charles W. Johnson, I was able to examine many European species, including the genotypes of most of the known genera. He also furnished much interesting material from his collection, and, through him, from the collection of the Boston Society of Natural History. With the above mentioned material, and some from various other sources at hand, I felt a revision of the North American species, especially of the eastern United States, would make an acceptable contribution towards the knowledge of this family. Therefore from rough notes and descriptions of new forms made several years ago, originally intended for casual publication, augmented by re-descriptions of most of the known species, the construction of the present paper was attempted. After many interruptions in such preparation, it is offered, with full knowledge of its many gaps in composition and completeness.

The first collective work on our species is that by Loew in the first volume of his monographs. Since then there have been quite a number of isolated descriptions by Loew, Coquillett and Day. In 1900[1] and 1902[2] Hendel published revisions of the European species, erected some new genera, and adopted some of the little understood genera of Desvoidy and others. With the aid of these works, we are able to study our species more satisfactorily, and they have, of course, made this paper of mine a possibility. In several cases I have had to make an extensive study of the literature, which resulted in some important and not agreeable changes in the nomenclature of some of the genera.

[1]Verh. Zool.-Botan. Gesell., Wien, I, 319, 1900.
[2]Abh. Zool.-Botan. Gesell., Wien, ii, heft 1, 1902.

I wish to express my obligations to the following individuals for their instrumentality in securing the loan of material and in the granting of other favors, without which I could not have presented this paper: Mr. C. W. Johnson, Boston Society of Natural History; Dr. J. C. Bradley, Cornell University; the late Mr. F. Knab, U. S. National Museum; Mr. W. L. McAtee, U. S. Biological Survey; S. J. Hunter, University of Kansas; E. P. VanDuzee, California Academy of Sciences; Mr. M. C. Van Duzee, Mr. C. T. Greene, Mr. W. T. Davis, and Mr. N. E. Criddle. The material credited to these sources is indicated throughout this paper by self explanatory notation within [ ]. The illustration of the wings and the rough outlines of the profile of the heads were prepared by the author.

The species representing this family in our fauna, according to the existing catalogues, were for the greater part segregated into three genera, which were rather easily recognized on account of their head and antennal structure, namely *Sepedon*, *Sciomyza* and *Tetanocera*. While several other genera were recognized, mostly containing one or two species, they were not very well understood, i e., *Bischofia* and *Heterochila*.

I have not attempted a critical analysis or characterization of the family. This has been done for the European species by Hendel in his revision, which should be consulted by our students. In general there will be no difficulty in recognizing the genera and species belonging to the family, especially the species of the genera allied to *Sepedon* and *Tetanocera*, but those allied to *Sciomyza* are not so easily defined, especially the genera. The family characters may be briefly diagnosed as follows:

The post verticals diverging or parallel, never converging; the face in profile forming a sharp, often very acute angle with that of the oral margin; no vibrissae; arista generally pubescent to densely plumose; all tibiae with preapical extensors, but without other extensor bristles; the auxiliary vein complete to the costa and well separated from the first.

In separating the species from those of the other acalyptrate families, the following notes may be helpful; the Scathophagidae have distinct vibrissae; the Ortalidae and Trypetidae have no preapical tibial bristles (excepting in *Automola*); the Sapromyzidae are all small flies with the post verticals converging,

face generally convex; the Micropezidae are slender, long-legged flies without preapicals and the third and fourth veins converging; all the other acalyptratae have distinct vibrissae, or the auxiliary vein incomplete or coalescing with the first.

In the course of my studies it soon became evident that several closely allied genera possessed in common distinctly white arista, which were either microscopically, or densely long, white plumose, while other allied genera have the arista black, bare to densely black plumose. These characters are also correlated with others of more structural nature, and seem to be of such taxonomic value that I have allowed them to influence me in the definition of some of the tribes. I have recognized three subfamilies, one of which includes the genera *Dryomyza* and *Neurotena*. The species of these genera are surely related to some of the allies of *Sciomyza*. A few remarks regarding this matter are given under those genera. The remaining, more typical species are grouped under the two subfamilies as recognized by Hendel, which are so considered here without further analysis.

Synopsis of the Subfamilies

Propleural bristle present; femora without well developed bristles, but generally pilose; sternopleura with several bristles along upper margin; antennae short ..... **Dryomyzinae**

Propleural bristle present; femora with well developed bristles; second antennal joint short ..... **Sciomyzinae**

Propleural bristle absent; second antennal joint enlarged or elongate. **Euthycerinae**

Further and more extensive study of the genera and species of this family will, no doubt, show reasons to revise the above characteristics, but, from my study, these offer very agreeable groupings. The presence or absence of the propleural bristle seems, in the main, to correlate with the antennal development, but in some genera of the Euthycerinae this does not hold. When we get to *Sepedon*, the antennae become very elongate, with the second joint very much so, and, with the exception of one species, this is very slender and cylindrical.

Key to Genera

1. Arista black, bare, pubescent or plumose 2
   Arista white on apical portion, bare or pubescent 15

2. Second antennal joint short, broad apically, narrow basally, triangular, not quadrate....3
   Second joint quadrare to rectangular, broad basally and apically; no propleural bristle....11
3. Propleural bristle present and distinct....4
   Propleural bristle absent or microsopic....9
4. Pteropleura bare....5
   Pteropleura pilose, setulose or bristly....6
5. First vein bare or pubescent....**Dryomyza**
   First vein bristly, at least apically....**Neuroctena**
6. Fore tibiae with two preapical bristles; epistoma strongly projecting. **Sciomyza**
   Fore tibiae with only one preapical; epistoma at most weakly projecting....7
7. Clypeus very strongly exserted; long pilose species of the Arctic fauna. **Oedoparea**
   Clypeus not exserted; sparsely pilose to bare species....8
8. Frons shining to polished; slender, mostly shining black species. **Dichrochira**
   Frons opaque, or slightly shining anteriorly; robust, mostly opaque tawny species....**Melina**
9. Mesopleura setulose; middle and hind femora with bristles. **Achaetomelina**
   Mesopleura bare; femora without bristles....10
10. Frons black; slender species with short wings....**Heteropteryx**
    Frons tawny to yellow; robust species....**Renocera**
11. Wings with numerous fuscous or dilute, spots....12
    Wings hyaline with, at most, only fuscous clouding along the costa and veins, rarely streaks between veins....**Chaetomacera**
12. Frons strongly convex medianly, polished; yellow species with large round, blackish spots....**Poecilographa**
    Frons flat, opaque....13
13. Eyes vertical or oblique....14
    Eyes horizontal; two frontal bristles present, both reclinate; sterno- and pteropleura setulose....**Trypetoptera**
14. Two frontal bristles present, but anterior one proclinate; second antennal joint with two well separated spines above; sternopleura with well developed bristle....**Hoplodictya**
    Only one frontal bristle; second antennal joint with few closely set bristles or hairs above; sternopleura not bristly....**Monochaetophora**
15. Wings with numerous fuscous and diluted spots....16
    Wings, at most, fuscous only along veins, costa, or in streaks between the veins....18
16. Meso- and pteropleura bare; mesonotum irrorated, not vittate....17
    At least pteropleura setulose; mesonotum vittate....**Limnia**
17. Second antennal joint stout, flattened, rectangular, broad basally. **Euthycera**
    Second joint slender, cylindrical....**Dictyomyia**

18. Scutellum with only two bristles; second antennal joint elongate **Sepedon**
Scutellum with four bristles 19
19. Propleural bristle present; second antennal joint much shorter than third; frons shining ..... **Oidematops**
Propleural bristle absent; second antennal joint as long as third; frons opaque ..... **Hedroneura**

Subfamily Dryomyzinae

In this group I include those weakly bristled species with the pile well developed. The species consist mostly of large, pale colored forms, simulating some Scathophagids. The face, typically, is very concaved in profile, with well projecting epistoma, which character, however, is not present in one of our species. This character was considered important by Hendel, and probably exists in all European species. The antennae here are short, second joint triangular, third rounded or somewhat longer than broad.

I include *Oedoparea glauca* Coquillett[3] here, near *Dryomyza*. This species is thickly pilose with a discoidal third antennal joint, and a projecting clypeus which protrudes far beyond the slightly projecting epistoma; the scutellum has six bristles; the propleural bristles are present, but not easily distinguished from the surrounding pile. The general color is opaque, lead color. It was described from Alaska. I do not note it further as it is not likely to be found much farther south. The generic name *Oedoparea* may not be applicable to the species. In Williston's Manual the species is referred to *Heterocheila*, but I prefer to use the name under which it was originally described.

NEUROCTENA Rondani

1868. Rondani, Atti Soc. Ital. d. Sci. Nat., xi, 56.
1869. Rondani, Prod. Dipt. Ital., vii, (3), 9.

This genus does not seem to be well understood. It is not recognized in the European catalogues as distinct from *Dryomyza*, although Rondani specifically states that it differs in the ciliation of the second (evidently referring to our first) vein. This is certainly a character of generic importance in this family, and

[3]1900. Proc. Wash. Acad. Sci., ii, 458.

in comparison with the other genera it differs in like manner. *Dryomyza*, on the other hand, seems to be more closely related to *Sciomyza* than does this genus.

In various references to this ciliation, there has evidently been some confusion. Rondani considered the auxiliary vein the first, so that his second is our first. Loew[4] is evidently in error in stating that the third longitudinal vein is ciliate, which is not the case.

Genotype.—Dryomyza anilis Fallen.

Our species may be separated by the following table:

Tarsi and abdomen black; arista pubescent ..... **fumida**
Tarsi and abdomen pale.
  Arista bare; cross-veins clouded ..... **anilis**
  Arista plumose; cross-veins not at all or faintly clouded ..... **simplex**

Neuroctena anilis Fallen (Pl. II, fig. 20.)

1820. *Dryomyza anilis* Fallen, Dipt. Suec., ii, Sciom., 16.
1868. *Neuroctena anilis* Rondani, Atti Soc. Ital. Sci. Nat., xi, 56.
1881. *Dryomyza paltida* Day, Can. Ent., xiii, 89.

♀, ♂. Yellow to tawny; mesonotum and abdominal segments sometimes dark. Pile of occiput, pleura, pectus, venter, femora below, long and pale. Arista base pale. Other pile, setulae and bristles, black. Wings yellowish-hyaline with cross-veins distinctly clouded.

Head subspherical, broader than high. Eyes round, bare. Frons quadrate, setulose anteriorly, with prominent margin; areas hardly differentiated; inner and outer verticals divergent and reclinate; post-verticals divergent, situated behind the anterior ocellus; two to three laterally inclined frontals. Face much sunken, so that the antennae are, generally, partly concealed by the overhanging frontal margin; profile concaved, retreating, with very prominent epistoma; parafacialia bare, broad. Cheeks broad, bare except lower part; occiput convex, pilose. Clypeus well developed. Palpi cylindrical, pilose; proboscis fleshy. Antennae pendent, situated above center line of eyes; second joint short, triangular, setulose, with a long hair above; third joint longer than broad; arista long, bare, or with few hairs near base.

Thorax quadrate; mesonotum convex, short pilose. One pair of prescutellars, two dorsocentrals, sometimes a bristle laterad of the first dorsocentral, one supra-alar, one presutural, one humeral, two notopleurals, one peopleural, one to three sternopleurals generally hair-like, sometimes strong, but always weaker than usual with other species. Meso- and pteropleura bare. Scutellum convex, with four bristles. Abdomen ovate, slender, pilose. Legs simple, with pilose femora; fore and hind tibiae with preapicals hair-like; middle tibiae bristly on posterior surfaces and at apices, their tarsi with lateral apical bristles; claws curved; pulvilli distinct. Wings long; first vein

[4]Monograph, i, p. 128,

short, ending opposite anterior cross-vein, setulose to apex; second vein ending before apex of wing; third, curved so as to narrow the submarginal cell at middle, divergent from second and subparallel with fourth veins; first basal cell twice as long as second; small cross-vein at middle of discal cell; anal and second basal cells subequal, former truncate at apex. Length.—6 to 9 mm.

Neuroctena simplex Loew (Pl. II, fig. 21.)

1862. *Dryomyza simplex* Loew, Mon. Dipt. N. A., i, 128.

Similar to *anilis* in color but the cross-veins are not, or at most the posterior one faintly, clouded. Pile short and mostly black, only that on venter and beneath femora pale. Frons with only one frontal bristle. Antennae erect. Face slightly concaved, not sunken and with no overhanging frontal margin; epistoma not prominent. Arista distinctly plumose. Length.—4.5 to 7 mm.

Described from the Middle States. Type should be in the Museum of Comparative Zoology. I have not seen it.

I cannot exclude this species from the genus on account of the weakly produced epistoma, in which respect it is similar to some species of the Sciomyzinae sens. strict.

Specimens Examined.—10 ♂, 6 ♀.

New York: Ithaca, June 6 to August 28, [Cornell].

New Jersey: Delaware Water Gap, July 14, (C. W. Johnson), [Johnson].

Neuroctena fumida Coquillett.

1901. *Neuroctena fumida* Coquillett, Proc. U. S. Nat. Mus., xxiii, 616.

Similar to *simplex*. Abdomen except apex and base, and all tarsi, black. Arista, bristles and pile, black. Arista pubescent. Wings dark yellow. Presentellars wanting. Third costal section one-half to one-third as long as ultimate section of fourth vein. First vein bristly at apical portion only. Fore femora with bristles above. Hind femora with numerous anterior flexor setulae. Length.—5 to 5.5 mm.

Type.—♀; Beulah New Mexico, August 17, (Cockerell), [U. S. N. M., no. 5594].

Before me is a female from Carbonate, Columbia River, British Columbia, July 7 to 12, (J. C. Bradley), [Cornell]; also a male from Dutch Lake, Grant, Colorado, alt. 11,000 ft., August 11, (E. C. Jackson), [Biol. Surv.].

This species is noticeable in its flattened face, with but slightly prominent epistoma. In general it is less pilose and more strongly setulose than the other species, especially as to the legs. It might easily be confused with *Renocera longipes* at first glance, although considerably stouter. The limited series of bristles on

the first vein suggests *Dryomyza*. They are easily overlooked. The black abdomen and tarsi, and the pubescent arista are also characteristic.

DRYOMYZA Fallen

1820. Fallen, Dipt. Suec., Sciom., 15.

This well known genus has been rather misused, and evidently not well understood. In this short study I have secured some very interesting results which will help to establish the status of the genus. In most of the present catalogues the genus is placed in a distinct family bearing its name. I can not follow this treatment.

The genus was originally proposed for the reception of two species—*Dryomyza vetula* Fallen, and *Dryomyza anilis* Fallen. The former is synonymous with *Musca flaveola* Fabricius (Meigen, 1826) which was designated, by Westwood in 1840, as the type species of this genus. *Dryomyza anilis* was made, by Rondani, the type species of his new genus *Neuroctena* (1868). The two genera are listed in Aldrich's Catalogue, page 578, as distinct, but upon a study of the literature and some American collections it is evident that the two genera, or, even the two species, were not well understood. I cannot follow Hendel in recognizing the projecting epistoma as a family character. There seems to be too much intergradation in this respect. The two genera may with propriety, however, constitute a distinct subfamily of the Sciomyzidae.

Genotype.—Musca flaveola Fabricius (as *Dryomyza vetula* Fallen).

Dryomyza dayi new species (Pl. II, fig. 22.)

This may be merely a subspecies of the European *flaveola*, which I have examined, but it is not identical. Our form is smaller with longer face; epistoma not so prominent and the antennae more porrect. The bristles seem to be weaker; those of the sternopleura in the male of *flaveola* are strong.

This species may be found in most collections under the name of *Neuroctena* or *Dryomyza anilis*, but it is easily separated from that species by the first vein of the wings being bare.

♂. Yellow to tawny; mesonotum and abdominal segments sometimes dark; setulae and bristles, black; pile of occiput, pleura, pectus, abdomen mostly, and femora, pale. Wings yellowish-hyaline; cross-veins more or less clouded.

Structurally similar to *Neuroctena anilis*. Frons broader than long; anterior portion not overhanging, but projecting beyond orbits in profile, one reclinate frontal bristle. Face with epistoma not as prominent as frontal margin; foveae shallow. Cheeks nearly as broad as eyes; setulose below; the three post-buccal bristles weak or pale. Antennae subpendent; third joint twice as long as broad, rounded apically; arista coarsely pubescent or shortly plumose. Mesonotum with two post-alars, two supra-alars. There are one or two propleurals, and the sternopleurals are black, hair-like. Wings with first vein bare, ending beyond small cross-vein; anal cell twice as long as second basal, with truncate apex. Length.—8 mm.

♀. Similar but the pile shorter, especially on the femora, where it is mostly black and bristle-like on the fore pair. Sternopleural bristles stronger. Middle tibial bristles weak or wanting.

Type.—♂; Ithaca, New York, July 21, 1887, (L. F. Psotta), [Cornell University].

Specimens Examined.—26 ♂, 24 ♀.

Canada: Carbonate, Columbia River, British Columbia, July 7 to 12, (J. C. Bradley), [Cornell].

New York: Ithaca, June 9 to September 18, [Cornell].

Subfamily Sciomyzinae

Hendel characterized this group as having the prothoracic bristle present, while the median frontal channel is usually wanting. We may continue to use this characterization with propriety and also add several others which seem to be associated, especially as regards the genera here treated. The second antennal joint is short, triangular, and the femoral bristles well developed.

The subfamily is a group which will likely give the students more trouble than the others, as the status of the included genera is not very well understood, and many of the latter are possibly peripheral in regards to the limits of the Sciomyzidae, as it is generally recognized in the next subfamily. The typical genus is *Melina* (*Sciomyza* of authors), but as *Sciomyza* is still included it is proper that the name be retained for the subfamily. Two tribes are here suggested, and may at present be recognized by the facial and antennal structure.

Tribe *Oidematopsini*

The new *Oidematops*, apparently a Sciomyzid genus, does not fall within the limits of any other group considered in this paper, but, as it has most of the characters of the Sciomyzinae, it seems

advisable to retain it in a distinct tribe, coming before the Sciomyzini. On the other hand it has much that suggests the Sepedontini, but can not very well be placed in the Euthycerinae. There being but one genus known to belong here, it is hardly possible to give any positive tribal characters, especially as the status of the Sciomyzini also is not well established. However, the tumor-like structure of the face and the elongate antennae, with their white arista, are very noticeable characters which, however, may not be confined to the present genus.

OIDEMATOPS new genus

This genus is seemingly allied to *Sciomyza* sens. strict. in possessing two preapical bristles on the fore tibiae, and in the protruding epistoma; but simulating *Sepedon* and its allies in general appearance and antennal structure. Further generic characters may be gleaned from the full descriptions of the genotype below.

Oidematops ferruginea new species

♂, ♀. Shining, tawny to brown; bases of third antennal joint, arista, palpi, halteres, base of wings, and legs, paler. Apical two-thirds of third antennal joint, velvety spot on upper praefacialia, first four joints of fore tarsi of male, apices of fore tibiae, and fore tarsi, except apically in female, black. Wings hyaline with brown tinge; costa apically, apical half of second, and all of third to fifth, veins, broadly clouded.

Head broader than high; eyes round or vertically oval; occiput convex, with vertical margin obliterated. Frons broad, depressed on its full width, projecting at antennae, without distinctly defined areas, bare; tubercle removed from vertex, with bristles well developed; two frontals. Lunule not visible. Face broad, in profile deeply emarginated, with a large, rounded, tumor-like swelling above, between the narrow, distinct foveae, which are evident to as far as cheeks; parafacialia broad; median area sharply defined; epistoma strongly protruding. Palpi cylindrical. Antennae elongate, porrect; first and second joints subequal, as long as broad, second without bristles; third not broader, slightly narrowed beyond middle, three or four times as long as broad; arista thick basally, densely, short, white plumose.

Thorax much longer than broad; mesonotum flattened posteriorly, possessing one humeral, two notopleurals, one supra-alars, two post-alars, and one dorso-central. Mesopleura bare; propleural bristle present; pteropleura bristly. Scutellum triangular, with four bristles. Abdomen elongate, cylindrical, not broader than thorax; third and fifth segments subequal; sixth much shorter. Legs simple, slender; fore and hind femora with lateral extensors; fore and middle tibiae each with two preapicals; hind tibiae with one preapical. Wings long and narrow; second to fourth veins parallel; small cross-vein beyond middle of discal cell; hind cross-vein straight, perpendicular. Length.—7 to 8 mm.

Type.—♂; Manchester, Vermont, June 8, 1910, (C. W. Johnson), [B. S. N. H.]. *Paratypes.*—1 ♀; topotypical. 1 ♂; New Jersey, [A. N. S. P.]. 1 ♀; Niagara Falls, New York, June 13, 1909, (M. C. VanDuzee), [VanDuzee].

Tribe *Sciomyzini*

This is somewhat of a heterogeneous group, possessing most of the characters mentioned under the subfamily. It is mentioned here simply in contradistinction to the other tribe. The antennae are short; third joint broad and rounded apically, with a black arista. The face is generally flat in profile, or rarely concaved with prominent epistoma.

SCIOMYZA Fallen

1820. Fallen, Dipt. Suec., Sciom., 11.
1902. *Bischofia* Hendel, Ver. Zool.-Bot. Ges. Wien, lii, 52.

The above synonymy is necessary on account of the selection of *Sciomyza simplex* Fallen (1820), by Westwood in 1840, as the type-species of *Sciomyza*, and by Hendel, in 1902, as the type-species of his new genus *Bischofia*. The *Sciomyza* of authors is now known as *Melina* Desvoidy.

In the present genus we have the general characteristics of *Melina* with the following differences: Fore and middle tibiae with two preapicals; arista long plumose; epistoma strongly projecting. The species are more robust and larger than those of *Melina*. The wings of the known species are immaculate, at most with clouding along the costa and cross-veins. The known species show more or less sexual dimorphism in color and structure, so care should be exercised in describing new ones. Our species are known only in the female sex, and may be separated as follows:

Mostly black; arista sparingly plumose ..... **varia**
Tawny; arista densely black plumose ..... **aristalis**

Sciomyza varia Coquillett

1904. *Bischofia varia* Coquillett, Can. Ent., xxxvi, 12.

♀. Black, shining. Head including antennae, pleura, halteres, sometimes scutellum and lateral margins of abdomen, all coxae, bases of hind femora, middle legs except apices of femora, paler. Wings infuscated along costa and veins. Palpi black. Length.—6 mm.

Originally described from Rigaud, Quebec, Canada, and type in collection of C. W. Johnson. Before me is a female from Ottawa, Canada, July 19, [C. W. Johnson].

Sciomyza aristalis Coquillett (Pl. II, fig. 25.)

1901. *Dryomyza aristalis* Coquillett, Proc. U. S. Nat. Mus., xxiii, 617.
1904. *Bischofia aristalis* Coquillett, Can. Ent., xxxvi, 12.

♀. Tawny to yellow; shining to polished. Frons anteriorly, sides of face, cheeks, antennae, halteres, fore coxae, legs except fore tarsi, paler. Arista and the dense plumosity, face medianly below, apices of palpi and fore tarsi, black. Wings yellowish, with cross-veins and apices clouded. Scutellum broad, slightly emarginated apically. Length.—7 mm.

Originally described from Ottawa, Canada, [U. S. N. M. no. 5505].

Specimens examined.—4 ♀.
CANADA: Kearney, Ontario, July 15, (M. C. VanDuzee), [VanDuzee].
NEW HAMPSHIRE: Bretton Woods, June 28, (C. W. Johnson), [B. S. N. H.].
NEW YORK: Niagara Falls, July 7, [VanDuzee].
MICHIGAN: Mackinac Island, July 5, [VanDuzee].

DICHROCHIRA Hendel

1902. Hendel, Abh. Zool.-Bot. Ges. Wien, ii, 57.

Seemingly a poorly defined genus structurally, but well marked in color characters. The known species are slender, shining, with shining frons; arista black, loosely plumose; wings immaculate, at most with costa and veins clouded; pteropleura setulose. Mostly black, especially the mesonotum, abdomen and fore tibiae. The species should not be confused with those of *Hemitelopteryx*.

Genotype.—*Sciomyza nigrimana* Meigen (1830), by original designation.

Key to the Species

1. Palpi and third antennal joint entirely black ..... **albicalceata**
   Palpi and third joint mostly yellow 2
2. Pleura and metanotum black 3
   Pleura and metanotum tawny ..... **apicata**
3. Apices of fore tarsi white; only one frontal bristle ..... **pleuralis**
   Tarsi entirely black; two frontal bristles ..... **glabricula**

Dichrochira apicata Loew

1876. *Sciomyza apicata* Loew, Zeit. für Ges. Naturw., Berlin, xlviii, 33.

This species, as I have recognized it, may be distinguished by the pale third antennal joint, which is, however, margined with black, the pale palpi, which are also margined, and the pale pleura, including the metanotum. The

two apical joints of fore tarsi are white; there is only one frontal bristle. The arista is rather long plumose. Length.—3.5 mm.

Originally described from a female from Fort Resolution, Hudson Bay Territory, (Kennicott).

The above description is based on a male from the District of Columbia, July, (Coquillett), [U. S. N. M.]. I have also before me a female from Beverly, Massachusetts, June 20, [U. S. N. M.], which differs in several important points. It has two frontal bristles; the mesonotum and scutellum are ferruginose, leaving only the anterior margin of the former black. In other respects it is similar to, and I think conspecific with, the male. I found these two specimens in the National Museum labelled as *S. apicata*, probably determined by Coquillett.

Dichrochira pleuralis new species

Suggesting my determination of *glabricula* excepting for the tarsal character and in having only one frontal bristle. On the other hand very similar to *apicata* as herein described, but more shining and the pleura entirely black.

♂. Thorax, including the pleura, pectus, and metanotum black, shining to polished, with a cinereous dusted area on sternopleura. Only one frontal bristle present. Cheeks linear. Only the apical joint of fore tarsi pale. Wings not infuscated along the veins. Length.—3 mm.

Type.—♂; Swarthmore, Delaware County, Pennsylvania, July 25, 1909, (E. T. Cresson, Jr.), [A. N. S. P. no. 6220].

Dichrochira albicalceata new species (Pl. II, fig. 23.)

A distinct species, apparently similar to *D. oldenbergi* Hendel of Europe. Easily recognized by the black third antennal joint, face and palpi.

♀. Black; shining. Anterior margin of frons, sides of face, cheeks, lower occiput, antennae except the black third joint, proboscis except the black palpi, pleura, halteres, base of abdomen laterally, legs excepting the black apices of fore femora, fore tibiae and two basal joints of fore tarsi, yellow. Notopleura and a broad upper pleural stripe, tawny; metapleura black; fore coxae, apical three joints of fore tarsi, white; squamae and cilia pale yellow. Wings brownish with faint infuscation along veins. Notopleura and mesonotum more or less gray; fore coxae and sides of face silvery. Frons with two frontal bristles, the anterior one weak; arista long plumose. Length. —4 mm.

Type.—♀; Boston, Massachusetts, July 4, 1911, (C. W. Johnson), [B. S. N. H.].

Dichrochira glabricula Fallen

1820. *Sciomyza glabricula* Fallen, Dipt. Suec., Sciom., 15.
1902. *Dichrochira glabricula* Hendel, Abh. Zool.-Bot. Ges. Wien, ii, 61.

A male from Popoff Island, Alaska, July 13, (T. Kincaid), [U. S. N. M.], agrees well with the description by Hendel. The anterior part of the frons, antennae, face, lower occiput, mesopleura, fore coxae, base of fore femora, middle and hind legs entirely, squamae and root of wings, pale yellow. All other parts black. There are two frontal bristles, and the arista is short plumose. Length.—3 mm.

ATRICHOMELINA new genus

I propose this genus for the reception of *Sciomyza pubera* Loew, its genotype. The propleural bristle is microscopic, so at first easily overlooked, but after examining a series of specimens one will find this bristle is present, but more strongly developed in some specimens than in others. It is easily confused with the near-by pile or setulae on the mesopleura. The pteropleura are setulose without the two or three characteristic bristles as in *Melina* proper, although in that genus these bristles are rather numerous and suggesting long setulae. There is only one well developed frontal bristle, with or without an adjacent minute anterior one.

Atrichomelina pubera Loew

1862. *Sciomyza pubera* Loew, Mon. Dipt. N. A., i, 106.

This species should not be confused with *Melina similis* or *vitalis*.

♂, ♀. Dark species. Frons opaque or faintly shining. Mesonotum distinctly striped with brown. Abdomen dark brown with medianly interrupted, whitish, apical margins to segments. Fore legs dark, with basal joints of tarsi conspicuously whitish. Wings hyaline with cross-veins clouded. In some specimens the apical pale border of the segments enlarge into sublateral triangles which attain the bases of the segments, so that the abdomen appears rather whitish with a median and lateral series of brown triangles. This condition is more noticeable in the western specimens, which are also larger (5 to 6 mm.). The abdominal pile longer than is usual in *Melina*. Length.—4 to 6 mm.

Originally described from a male from the Middle States.

Specimens examined.—19 ♂, 11 ♀.

Connecticut: Winnipank, August 4, (C. W. Johnson), [B. S. N. H.].

New York: Beaverkill, Sullivan County, August 5, (Cresson), [A. N. S. P.]. Ithaca, June 22 to July 2, [Cornell].

Pennsylvania: Swarthmore, August 21 to October 19, (Cresson), [A. N. S. P.].

District of Columbia: Chain Bridge, September 8, (Knab and Malloch), [U. S. N. M.].

Virginia: Dead Run, Fairfax County, March 14 and June 18, (R. C. Shannon), [U. S. N. M.].

California: Berkeley Hills, September 9, (J. C. Bradley), [Cornell]. Palo Alto, June 3, (M. C. VanDuzee), [VanDuzee].

MELINA Desvoidy

1830. Desvoidy, Myod., 695.

This name must replace *Sciomyza* of authors, on account of the designation, by Westwood (1840), of *Sciomyza simplex* Fallen as the type-species of *Sciomyza*, which species is not congeneric with those constituting the present genus. *Melina* was proposed for the reception of a new species, *riparia*, which is synonymous (Hendel, 1910) with *Sciomyza dubia* Fallen (1820).

The genus is not well marked and further study may result in the separation of some of its groups as distinct genera. Dr. Hendel did much to establish the European species on stable bases. The specific characters seem to have been little understood, so that comparisons with European named material, unless determined by Hendel or some other recent and competent authority, will give little satisfaction. Fortunately Dr. Hendel's revision treats this genus very thoroughly, making it comparatively easy to determine European material; however, unless comparison is made with authentically determined European specimens, I do not feel warranted in using European names for our forms if any doubt exists regarding such determinations. Consequently I retain the specific name based on American material whenever certain of the determination.

The genus, as limited here for our species, may be diagnosed as follows: Head much broader than high; frons opaque, or slightly shining anteriorly; one or two frontal bristles; lunule not protruding. Face short, epistoma, at most, slightly prominent. Propleural bristle well developed. Fore tibiae with one preapical bristle. Our species are opaque, more or less cinereous, with fore tibiae apically, and at least, apical joints of tarsi, black,

and middle and hind tibiae pale; pleura with distinct brown stripe from below humeri to base of abdomen.

The species of our fauna are grouped into three subgenera, which are more fully discussed in their places below.

Key to the Species of Melina

1. Wings fuscous, with numerous isolated diluted spots ..... **guttata**
   Wings hyaline, with isolated fuscous spots or cloudings 2
   Wings hyaline, with at most only the cross-veins or longitudinal veins clouded 5
2. Marginal cell clouded beyond first 3
   Marginal cell clouded only at extreme apex; first and second veins pale; third to fifth dark and clouded; pale yellow species ..... **albocostata**
   Marginal cell with several isolated fuscous spots ..... **maculata**
3. First posterior cell broadly clouded apically; costal cell conspicuously white. **albovaria**
   First posterior cell without any fuscous band; costal cell not white; second posterior cell with appendage from fourth vein ..... **tenuipes**
   Submarginal and first posterior cells with a subapical fuscous band 4
4. Submarginal cell with several fuscous spots basad of the subapical band. **strigata**
   With only the subapical band fuscous ..... **nana**
5. Mesofrontal stripe distinct, narrow, subopaque, and more or less complete 6
   This stripe absent or represented only by the gray attenuation of the ocellar triangle 7
6. Antennae entirely tawny; wings with clouded cross-veins ..... **trivittata**
   Antennae dark apically; cross-veins not clouded ..... **grisescens**
7. Frons with only one frontal bristle; mesopleura entirely setulose; propleural bristle microscopic ..... **Atrichomelina pubera**
   Frons with two frontals; mesopleura at most setulose along the posterior margin 8
8. Mesopleura entirely bare 9
   Mesopleura with posterior margin setulose; robust, dark ferruginous species ..... **spadix**
9. Dark species 10
   Pale species ..... **albocostata**
10. Anterior frontal bristle midway between the other frontal and anterior margin of frons; second posterior cell with appendage from fourth vein. **tenuipes**
    Anterior frontal much nearer the other one; rarely with appendage in second posterior 11
11. Fore tarsi entirely black ..... **vitalis**
    Fore tarsi pale basally ..... **similis**

Subgenus **MELINA** Desvoidy

In this group are placed those species having the wings hyaline or, at most, marked or clouded along the veins or costa. They have well developed propleural and two frontal bristles.

Melina fusca new species

This species may be recognized by the general ferruginous color, instead of black as in the other associates, and by the mesopleura being setulose along the posterior margin. The type seems to agree with a specimen seen in the United States National Museum under the name *Sciomyza dorsata*, but which does not agree with Hendel's description of that species.

♀. Brown to yellowish brown. Mesonotum, metanotum, bases of abdominal segments, upper surfaces of femora, darker; an interrupted median abdominal stripe also darker. Wings hyaline with cross-veins clouded. Opaque, ochreous dusted; mesonotum with four stripes. Scutellum paler.

Frons broad as long; the opaque gray frontal stripes not more than one-half of length of frons. Arista short plumose. Cheeks not one-half of eye-height. Mesopleura setulose along posterior margin, otherwise bare; pteropleura setulose and with two bristles; fore coxae with three bristles; small cross-vein slightly beyond middle of discal cell. Length.—5 mm.

Type.—♀, University, North Dakota, June, 1896, (R. P. Currie), [U. S. N. M.].

The specimen was found in the National Museum under the name *S. obtusa* Fallen. It seems to be *obtusa* according to Loew (1862), but not Hendel (1902).

Melina vitalis new species

In color and structure similar to *nana* Fallen, but the wings, with the exception of the cross-veins are hyaline, without any trace of infuscation or color excepting the yellow stigma. It should not be confused with *pubera* or *similis*.

♂. Black, grayish dusted. Frons, face, cheeks, lower occiput, fore coxae, middle and hind legs, and halteres, pale. Fore legs excepting knees, entirely black; middle and hind femora and tibiae, at most, with faint apical infuscation. Wings hyaline, stigma yellow; cross-veins at most very narrowly clouded. Mesonotum finely irrorated, at most, faintly vittate; scutellum concolorous. Abdominal bands entire; apices of segments narrowly white.

Frons broad as long, with two frontals; anterior portion slightly shining. Arista bare or micro-pubescent. Mesopleura entirely bare; pteropleura setulose and with two bristles. Fore coxae with two bristles beneath. Small cross-vein beyond middle of discal cell. Length.—3 to 5 mm.

Type.—♂, Berkeley Hills, Alameda County, California, March 22, 1908, (Cresson), [A. N. S. P. no. 6221].

Specimens Examined.—1 ♂, 3 ♀.

Massachusetts: Wood's Hole, July 25, [B. S. N. H.].

Idaho: Moscow, June 2, (Cresson), [A. N. S. P.].

California: Berkeley Hills, March 22; Redwood Cañon, Marin County, May 17, (all Cresson), [all A. N. S. P.].

Variations and Notes.—There are variations in the color of the fore femora, and in the intensity of the apical infuscation of the hind femora and tibiae. The specimen from Wood's Hole (female) was received determined as *Sciomyza obtusa* Loew, but it does not agree with the description of that species. Loew probably had this or one of its allied forms before him when writing for the Monographs, but whatever he knew as *obtusa* Fallen cannot have weight now in this homogeneous group. We must revert to the type whenever possible. The European *obtusa* (Hendel 1902) has the frons opaque, with a gray dusted band anteriorly; fore legs hardly darker than the others; arista short plumose. From the European *S. dorsata* Zetterstedt our form differs in the darker fore femora, and the mesopleura being non-setulose. Our form may be *S. ventralis* Fallen, but I should prefer to compare authentic specimens of the two before considering such a reference. In some collections this form may be found under *S. humilis* Loew, an entirely different insect.

Melina vitalis variety **similis** new variety

This form may prove to be specifically distinct, but, based on the meager series of two specimens, I will not attempt to consider it as such at present. There seem to be a few characteristics which may be considered of specific value. Its similarity to *vitalis* is evident, but on the whole somewhat paler, especially on the legs; frons narrower and more opaque. The fore femora are pale except apically, bases of fore tarsi whitish but not conspicuously so, the apical infuscation of middle and hind femora more pronounced.

Type.—♂, Milwaukee, Wisconsin, June 18, [U. S. N. M.].

A male labeled "D. C." (Coquillett), in the National Museum, which was found placed under the name *obtusa*, seems to be conspecific with the type. In Hendel's revision this form runs to *annulipes* Zetterstedt.

Melina albocostata Fallen (Pl. I, fig. 15.)

1820. *Sciomyza albocostata* Fallen, Dipt. Suec., Sciom., 12.

Our specimens agree with those examined from Europe, and with Hendel's description.

♀. General color pale yellow with pleural stripe distinct. The wings are pale yellowish hyaline with infuscation as figured (fig. 15), with the costa, stigma, and marginal cell including the auxiliary, first and second veins, contrastingly white. Sometimes this differentiation in the color of the wing is not very well marked. In any case the general pale color of the insect will distinguish it from the others of this group. The two frontal bristles are approximate; the mesopleura bare or with one or two microscopic setulae along the posterior margin. The species is apparently boreal in its distribution in our fauna. I have not seen the male sex. Length.—4 to 5 mm.

Originally described from Europe.

Specimens Examined.—9 ♀.

Canada: Kaslo, British Columbia, July 17, (R. P. Currie), [U. S. N. M.].

Maine: Camp Kennedy, 3000 ft. alt., Mt. Katahdin, August, [U. S. N. M.].

New Hampshire: Bretton Woods, June 28; Halfway House, Mt. Washington, July 16; Mt. Washington, 2000 ft. alt., July 6 to 28; (all C. W. Johnson), [all B. S. N. H.]. Mt. Washington, (G. Dimmock, near summit), [U. S. N. M.].

Colorado: 1 specimen, [U. S. N. M.].

Melina tenuipes Loew

1872. *Sciomyza tenuipes* Loew, Berl. Ent. Zeit., xvi, 99. (Cent. x, 80.)

A species distinguished from the other dark forms by the smaller size, more slender build, longer gray frontal stripes, and pale scutellum. The anterior frontal bristle is midway between the posterior and the anterior frontal margin. In the other species these bristles are nearer together. The single long bristle on the palpi is another character of note.

♂, ♀. Black to brown; frons anteriorly, antennae, face, cheeks, palpi, halteres, humeri, scutellum, fore coxae and middle and hind legs, pale. Wings brownish, more or less infuscated along the costa beyond first vein, including submarginal cell; third to fifth veins rather distinctly infuscated. Fore legs excepting coxae entirely black; hind femora not infuscated apically. Opaque; broad frontal orbits, median triangle, occiput, mesonotum, scutellum, pleura, metanotum, and abdomen more or less densely grayish; mesonotum narrowly vittate with brown anteriorly; apices of abdominal segments narrowly whitish. The gray frontal stripes much more than one-half as long as frons.

Eyes round; frons broader than long. Epistoma weakly and sharply produced; cheeks one-third of eye-height. Third antennal joint nearly cir-

cular; arista microscopically pubescent. Palpi with a long apical bristle. Mesopleural bare; pteropleura with strong setulae. Fore coxae with two bristles. Fourth vein with appendage into second posterior cell. Length.—3–4 mm.

Described from a male from the Middle States, (Osten Sacken) and I feel certain of this determination.

Specimens Examined.—2 ♂, 4 ♀.

MAINE: Machias, July 20, (C. W. Johnson), [B. S. N. H.].

MARYLAND: Cabin John, April 15, (R. C. Shannon), [U. S. N. M.].

Subgenus **GRAPHOMYZINA** Macquart

1835. Macquart, Hist. Nat. Ins., Dipt., ii, 558.

I cannot find any satisfactory characters for separating this group generically from the foregoing, although the type-species, *Sciomyza limbata* Meigen (1830), is very distinct in its horizontal, oval eyes and sharp vertical margin. Of our species, *guttata* is the most typical and probably a true *Graphomyzina*, but I do not think propriety will be seriously endangered by including other species with distinct wing maculation, such as *nana*, *strigata*, and *maculata*. The latter differs from the former two in having the marginal cell marked with isolated fuscous spots, and is not uniformly clouded. Here is also included *albovaria*, but this species is evident peripheral in position and is placed next to those in *Melina* proper.

Melina (Graphomyzina) albovaria Coquillett (Pl. I, fig. 4.)

1901. *Sciomyza albovaria* Coquillett, Proc. U. S. Nat. Mus., xxiii, 616.

♂. Dark, brownish; frons, especially anteriorly, except antennae, face, cheeks, antennae, humeri, halteres, apices of abdominal segments, fore coxae, knees, femora and tibiae except bases and apices, and all tarsi, pale. Wings with fuscous markings as figured (fig. 4). There are generally one or more supernumerary cross-veins in the first posterior cell.

Opaque to subopaque. A velvety black orbital spot at each antenna; shining black spot above epistoma, and a brown spot on cheeks. Mesonotum olive gray with distinct brown vittae; scutellum brown on disk; pleura with two broad brown stripes, leaving the humeri and upper part of mesopleura yellow; mesopleura bare. The two frontal bristles approximated. Length.—3 to 5 mm.

♀. Similar but the four apical joints of fore tarsi are black, the basal one white.

Described from the two sexes from New York, New Hampshire and North Carolina. Type in the United States National Mu-

seum. A species easily recognized by the black facial and antennal spots, as well as by the wing design.

Specimens Examined.—1 ♂, 1 ♀.

New Hampshire: Hanover, July 6, (C. W. Johnson), [B. S. N. H.].

New York: Ithaca, June 29, [Cornell].

Melina (Graphomyzina) nana Fallen (Pl. I, fig. 18; pl. II, fig. 26.)

1820. *Sciomyza nana* Fallen, Dipt. Suec., Sciom., 15.

A seemingly common species with little variation. Although no comparison has been made with European specimens, I have no doubt as to the determination.

♂, ♀. Dark, blackish; anterior frons, face, cheeks, antennae, except third joint above, palpi, halteres, fore coxae, middle and hind legs, except apical bands on femora and tibiae, pale. Wings as figured (fig. 18). Opaque to subopaque. Frontal stripe not extending beyond middle of frons. Thorax and abdomen more or less cinereous. Mesonotum more or less narrowly vittate; pleural stripe distinct. Fore legs except coxae and last tarsal joint, black. Mesopleura entirely bare. Length.—2.5 to 3 mm.

Originally described from Europe, and apparently truly represented in our fauna. It is easily recognized by the wing design.

Specimens Examined.—45 ♀, 21 ♂.

Canada: Carbonate, Columbia River, British Columbia, July 7–17, (J. C. Bradley), [Cornell].

Connecticut: Winnipank, August 4, (C. W. Johnson), [B. S. N. H.].

New York: Ithaca, July 23 to August 2, [Cornell].

Pennsylvania: Swarthmore, June 6 to August, (E. T. Cresson, Jr.), [A. N. S. P.].

Florida: St. Augustine, July 14, (C. W. Johnson), [Johnson].

Indiana: Muncy, August to September, [Cornell].

Illinois: Chicago, [Cornell].

Missouri: Columbia, (C. R. Crosby), [Cornell].

Colorado: Creed, August, (S. J. Hunter), [Kansas].

California: Berkeley Hills, March 14 to September 8, (J. C. Bradley and E. T. Cressor, Jr.), [Corenll and A. N. S. P.]. Los Angeles, May 3, (M. C. VanDuzee), [VanDuzee]. San Francisco, dunes, November 11; Wild Cat Canyon, San Pablo, Contra Costa County, November 16, (all J. C. Bradley), [all Cornell]. Tahoe, Lake Tahoe, August 3; Yosemite Valley, May 22, (E. T. Cresson, Jr.), [all A. N. S. P.].

Melina (Graphomyzina) strigata Van der Wulp

?1872. *Sciomyza trabeculata* Loew, Berl. Ent. Zeit., xvi, 100. (Cent. x, 81.)

1897. *Sciomyza strigata* Van der Wulp, Biol. Cent.-Amer., Dipt., ii, 355, pl. ix, f. 9.

In wing markings similar to *nana*, but the submarginal cell has several isolated fuscous spots basad of the large subapical

band. Although described from Mexico, I have seen a male from Texas in the U. S. National Museum collection (det. Coquillett), which seems to be correctly determined. It is probable that Loew's species is synonymous. It was described from a male from Texas.

♂, ♀. Similar to *nana*. Wings hyaline with fuscous stigma and marginal cell and fuscous transverse bars as follows: four in submarginal cell beyond first vein, one in first posterior cell each side of small cross-vein, and one beyond; two in discal cell, and one along fourth vein in second posterior. Cross-veins also clouded, and there are other faint indications of bars basad of the small cross-vein. Abdominal segments with broad brown bands which are interrupted laterally by a continuous narrow gray stripe; the ventral lobes of such segments narrowly gray.

Melina (Graphomyzina) guttata Coquillett

1901. *Sciomyza guttata* Coquillett, Proc. U. S. Nat. Mus., xxiii, 615.

The wings in this species are intensely brown, with numerous, small, quadrate, evenly arranged diluted spots, suggesting *Tetanocera ambigua* Loew.

♀. Similar to *maculata* but orbital spot at antennae velvety black; occiput with a horizontal brown post-orbital stripe; mesonotum finely irrorated with brown, not vittate; humeri and notopleura immaculate. A distinct black or brown stripe beneath humeri to root of wings and another, velvety brown spot between wings and halteres. Scutellum with large brown discal area. Halteres with dark spot on knobs. Abdomen gray with brown irrorations, becoming dense and coalescing at bases of segments, and also forming a more or less complete, broad median stripe. Legs with brown apices to middle and hind femora, and tibiae; two basal joints of middle and hind tarsi white; two apical ones black. Wings intensely fuscous with numerous small quadrate diluted spots arranged in two series between the veins, but only in two isolated groups of two or three in submarginal cell. Costal margin and apex broadly fuscous.

Originally described from a female from Texas. Type in the United States National Museum (no. 5502), from which the above description is drawn.

Melina (Graphomyzina) maculata new species (Pl. I, fig. 14.)

This species seems to be similar to the European *Melina (Ditaenia) schoenherri* Fallen. The series shows some variation in the color of the fore legs, which may be entirely black or at most knees and tarsi pale.

♂. Brown to tawny; frons anteriorly, antennae basally, face, cheeks, palpi, halteres, fore coxae, middle and hind tibiae and tarsi, pale. Wings

hyaline marked with numerous, rounded fuscous spots between the veins as figured. Opaque to subopaque; frons opaque yellow, its stripe, thorax and abdomen more or less cinereous. Length.—3–4 mm.

Type.—♂; Illinois, [A. N. S. P. no. 6222].

Specimens Examined.—1 ♂ and 3 ♀.

Canada: Downie Creek, Selkirk Mountains, British Columbia, VIII, 9, (J. C. Bradley), [Cornell].

New York: Ithaca, VII, 31, [Cornell].

Illinois: (type).

Montana: Beaver Creek, VIII, (S. J. Hunter), [Kansas].

Subgenus **DITAENIA** Hendel

1902. Hendel, Abth. Zool.-Bot. Ges., Wien, ii, 66.

As a genus this was originally based on the presence of a median frontal stripe extending to the base of the antennae, generally shining, dividing the frontalia into two narrow, more or less opaque, stripes. It seems to me that Hendel's conception of the genus was not very good, as this character will include several forms that otherwise seem to be generically distinct. In 1910, Hendel[5] considered this a subgenus of *Melina*. Based on the type-species, *Sciomyza cinerella* Fallen (1820), which I have seen, this seems logical, as the structure of the head is very similar. Our species, however, are apparently not subgeneric with *cinerella*, but I do not care to erect another subgenus in this group without further study of other European species.

In the setulose mesopleura and single frontal bristle the species here included simulate *pubera*, but there the simulation ceases. In the distinct median frontal stripe and distinct propleural bristle they are quite distinct. For a proper conception of the subgenus, it may be diagnosed by the narrow head, frons and face; frons with only one frontal, and the face rather distinctly subcarinate and produced at the epistoma. The mesonotal stripe is more or less distinct and shining. Our species, also, have the wings immaculate, with the exception of the clouded cross-veins; the pteropleura with distinct bristles.

Melina (Ditaenia) grisescens Meigen

1830. *Sciomyza grisescens* Meigen, Syst. Beschr., vi, 20.
1876. *Sciomyza humilis* Loew, Zeit. für Ges. Naturw., xlviii, 330.
1902. *Ditaenia grisescens* Hendel, Abh. Zool.-Bot. Ges., Wien, ii, 66.

[5] Wien. Ent. Zeit., xxix, 310.

♂, ♀. Black, more or less grayish; head, antennae, except apices of third joint, palpi, humeri, apex of scutellum, apex of abdominal segments and legs, except fore tibiae and tarsi, paler. Frontal orbits narrowly silvery; median stripe narrow, hardly attaining anterior margin; orbital spot of face indistinct or absent. Mesonotum narrowly striped. Median stripe of abdomen brown. Wings clear. Length.—3 to 4.5 mm.

The synonymy of *humilis* is by Hendel (1902, p. 66).

Of this species I have examined: 3 ♀ and 5 ♂.

Pennsylvania: Swarthmore, September, (E. T. Cresson, Jr.), [A. N. S. P.].

Florida: St. Augustine, March 15, [Johnson].

California: Los Angeles, May 1, (M. C. VanDuzee), [VanDuzee]. San Diego County, April 17, (M. C. VanDuzee; desert edge), [VanDuzee].

Texas: Plano, October, (E. S. Tucker), [U. S. N. M.].

Melina (Ditaenia) trivittata new species

Similar to *grisescens* but larger (5.5 to 6 mm.). Antennae entirely tawny; silvery frontal orbits broader; facial orbital spot distinct and black; mesonotal stripe broader and the abdomen with median and lateral series of narrow, brown spots. Wings yellowish with cross-veins clouded.

Type.—♀; Fremont, Nebraska, August, 1900, [Cornell University Coll.].

Subfamily Euthycerinae

This is Hendel's Tetanocerinae, but that name is not available now. Hendel's characterization of this group is the reverse of his Sciomyzinae. The prothoracic bristle is absent, while the median frontal channel is generally present. Further we may add that the second antennal joint is generally quadrate or longer, broad at base (exception is found in *Sepedon*). The genera may further be associated into convenient groups which are here designated as tribes, and may be characterized as follows:

Arista black.....**Chaetomacerini**
Arista white, or at most dark basally.
  Scutellum with four bristles.....**Euthycerini**
  Scutellum with only two bristles.....**Sepedontini**

Tribe *Chaetomacerini*

Here we have all the characters of the subfamily, with the addition of the black arista. This arista may be bare or plumose, but is always black, at most only the extreme base pale. The second antennal joint is generally quadrate, but becomes somewhat longer in some species. It is however more typically developed in the next tribe.

HEMITELOPTERYX new name

1902. *Heteropteryx* Hendel, Abth. K.-K. Zool.-Bot. Gesell., Wien, ii, 81, (nec Gray, 1835).

In our fauna, this is a genus of slender flies, with the frons velvety black excepting a shining median stripe. Second antennal joint short; third much longer than broad, with broad apex; arista densely, short, black plumose. Scutellum with but two bristles. Propleural bristle wanting; meso- and pteropleura, bare. Wings short, narrow; apex broadly rounded, the margins and veins straight and parallel. First vein ending in the costa beyond the small cross-vein.

There is only one, the following, species known in our fauna, which appears to be congeneric with the European *Heteropteryx brevipennis* Zetterstedt, although differing in several characters which may prove to be of more value than is apparent now. Among these are, the longer first vein, two instead of four scutellar bristles, and the densely, not loosely, plumose arista.

Hemitelopteryx johnsoni new species

A striking species with its velvety black frons and facial orbits.

♂. Head and mouth-parts black; antennae entirely yellow except the black arista. Thorax, scutellum and halteres tawny to yellow; mesonotum with anterior margin and two broad stripes, black. Abdomen except basal angles, black. Legs yellow; fore coxae white and silvery; apices of fore and hind femora infuscated; fore tibiae and tarsi, black, but apical joints of latter white. Wings blackish with dark veins.

Frons opaque, velvety black, with short vertical angles and broad median stripe, polished. Face with broad velvety black orbits, continuing over the cheeks to the occiput; median area and oral margin of cheeks polished. Pleura with silvery spots on sterno- and hypo-pleura. Length.—3.5 mm.

Type.—♂; Franconia, New Hampshire, (Slosson), [U. S. N. M.].

A female from Briggsville, North Adams, Massachusetts, June 18, 1906, [B. S. N. H.], is evidently conspecific and agrees with the male, except that the apices of the fore tarsi are also black.

RENOCERA Hendel

1900. Hendel, Verh. K. K. Zool.-Bot. Gesell. Wien, l, 333.

This genus has for its type, *Renocera stroblii* Hendel (Hendel, 1902, p. 18), and may be diagnosed as follows:

Tawny to yellow, generally opaque, flies. Median frontal stripe present. Second antennal joint much shorter than third.

Scutellum with four bristles. Fourth and fifth abdominal segments without distinct marginal bristles. Femora normal, slender; median and hind femora without distinct bristles; one preapical on tibiae. Third and fourth veins parallel.

In most respects our species closely simulate *Chaetomacera unicolor* and allies, but may be distinguished by the absence of the femoral and abdominal bristles.

Key to the Species

Two frontal bristles; mesonotum opaque; arista short plumose.... **johnsoni**
But one frontal bristle; mesonotum somewhat shining.
Arista densely plumose..... **longipes**
Arista loosely plumose..... **amanda**

Renocera longipes Loew

1876. *Sciomyza longipes* Loew, Zeit. Ges. Naturw., Berlin, xlviii, 328.

Loew's specimen of this species was lacking the third antennal joint, which fact was noted by Hendel in his remarks regarding the possibility of synonymy with *Sciomyza pallida* Fallen.[6] This synonymy may be possible, but there are some disagreements with the descriptions in several places, so that it is not advisable to chance confusion in the identification. That the specimen before me may not be *S. longipes*, is also possible, but I do not doubt the correctness of this determination.

♀, ♂. Entirely tawny to buff, except the black arista and blackish apical joints of fore tarsi. Wings yellow with dark veins; costa beyond first vein, and both cross-veins, broadly infuscated. Frons opaque, wax-yellow, with broad anterior margin, narrow median stripe, and vertical orbits, polished. Face silvery, with upper part tawny. Cheeks silvery. Antennae entirely tawny; third joint not infuscated apically. Mesonotum shining, faintly, narrowly vittate. Lower part of pleura opaque, silvery. Scutellum concolorous with mesonotum. Apices of abdominal segments narrowly whitish. Fore coxae whitish, silvery.

Frons slightly broader than long, with one frontal. Face slightly concaved, retreating. Cheeks equal to one-third of eye-height. Antennae with third joint three times as long as second, twice as long as broad, tapering to a rounded apex, and slightly concaved above; arista very densely plumose to tip. Mesonotum with one dorso-central, no prescutellar, but distinct presutural. Pleura, except sternopleura, bare. Scutellum flat with four bristles. Wings similar to *Chaetomacera clata*, but the hind cross-vein is straight, and stigma not infuscated. Length.—6 mm.

[6] Hendel, 1902, p. 76.

A female was originally described from New Hampshire (Osten Sacken).

My material consists of one male from Ithaca, New York, May 31, [Cornell], and one female from Sullivan County, Pennsylvania, 1800 ft. alt., June 6, [U. S. N. M.].

Renocera johnsoni new species (Pl. II, fig. 27.)

This and the following species suggests *Melina* (*Sciomyza* auct.) in general structure, but the absence of propleural bristles and pteropleural setulae exclude them. In placing them in this genus, I am influenced by the absence of the distinct abdominal and femoral bristles, although in the short, broad, second and large, rectangular third antennal joints, and in having but one frontal bristle, they are very distinct from *longipes*, and, probably represent a distinct group or subgenus.

♂. Pale olive buff to wax yellow; fore tarsi entirely and apices of middle and hind tarsi, black; halteres pale yellow; arista and bristles black; wings brownish hyaline with cross-veins broadly clouded. Frons wax yellow, with complete median and abbreviated orbital stripes fuscous. Face pale with silvery reflections. Occiput without silvery spots. Thorax and scutellum brownish gray; mesonotum with narrow, more or less distinct brown stripes; pleura lighter with broad brown stripe above. Abdomen paler, especially apically, with distinct median brown stripe and subapical fascia on third and fourth segments. Opaque with the complete median frontal stripe shining.

Structurally similar to *valida* and *clara*. Cheeks nearly equalling eye-height; second antennal joint half as long as third, broader than long; third, broadly rounded apically, nearly twice as long as broad; arista sparingly, short plumose. Thorax robust, short, subquadrate; humeral and prescutellar bristles absent and but one dorso-central. Fore femora with the extensor and flexor series well developed distally; hind femora with two flexor series. Hind cross-vein straight, almost at right angle with fourth vein. Length.—5 mm.

Type.—♀; Fort Kent, Maine, August 1, 1910, (C. W. Johnson), [B. S. N. H.]. *Paratype*.—1 ♀, Bear Lake, British Columbia, July 7, (R. P. Currie), [U. S. N. M.].

Renocera amanda new species

The specimen upon which this species is based was received as *Tetanocera rotundicornis* Loew. It does not, however, agree sufficiently well with the description of that imperfectly known species to remove doubt as to the correctness of the determination. As noted under *johnsoni*, the present species is very dis-

tinct from *longipes*. On the other hand it shows some similarity to the *Chaetomacera valida* group, probably closely allied.

♂. Tawny to yellow; two apical tarsal joints dark; all bristles and setulae, including arista, black. Wings yellowish-hyaline, with costal margin slightly darker; cross-veins distinctly clouded; stigma yellow. Subopaque; frons opaque, golden yellow, with abbreviated median orbital stripes and anterior margin, shining; face and cheeks pale yellow with silvery reflections; occiput with reflecting silvery spots. Mesonotum rather shining, non-vittate, sparsely pruinose medially; pleura whitish below, darker above but with no defined stripe.

Structurally similar to *valida*. Head shorter with one frontal; cheeks one-fourth as broad as eye-height; second antennal joint much broader than long; third, three to four times as long as second, twice as long as broad, broadly rounded apically; arista distinctly plumose. Abdomen cylindrical or flattened; genital segment subglobose or slightly conically pointed. Wings long and narrow; hind cross-vein straight perpendicular. Length.—4.5 to 5 mm.

♀. Similar to male; wings somewhat broader.

Type.—♂; Machias, Maine, July 28, 1909, (C. W. Johnson), [B. S. N. H.]. *Paratypes.*—2 ♀; Bretton Woods, New Hampshire, June 24, 1913, (C. W. Johnson), [B. S. N. H.].

CHAETOMACERA new name

1801. *Tetanocera* Dumeril, Millin Mag. Encycl., (4), iv, 446.
1900. *Tetanocera* Hendel, Verh. K. K. Zool.-Bot. Gesell. Wien, l, 335.

A study of the literature regarding this genus has given some surprising and not agreeable results. The old, well established name, *Tetanocera*, must be restricted to a genus in the Ortalidae, if the rules of the International Commission are to be followed, which rules as applied in this case are well recognized and acceptable. Some students may propose that the International Commission give a special ruling on this case in order to retain the old name, to which I would not demure, although I do not approve of any exceptions to well recognized and acceptable rules, even in a case where a genus is represented by a well-known, named species.

The name *Tetanocera* has been credited, by all authors, to Dumeril or Latrielle, and its date has been given as one ranging from 1798 to 1806. Dumeril's 1798 work does not seem to have been accessible to students. The continual reference by Latreille to Dumeril, without giving bibliographical data, has evidently

caused some confusion regarding the origin of the name. In 1860, in the *Annals Societe Entomologique de la France*,[7] a list of the publication of C. Dumeril is given. The third title there is "Exposition d' un Methode Naturelle pour l'etude et la classification des insectes. Magas. encycl., tom. 4, p. 433, an VI (1798)." The reference is evidently to Millin's Magazine Encyclopedique, a full set of which is in the library of the Academy of Natural Sciences of Philadelphia. I am unable to find any such reference as given above, but in volume four of the sixth series, on page 446, that title appears. Unfortunately the name, although used in the generic sense, is in the French vernacular, Tetanocere, and cannot be considered in generic nomenclature. The date of this volume is "AN IX—1801." The magazine was published in annual series of six volumes each, each series designated "Annee," so that the mistake in dates evidently occurred from the confusion of An (Annee) with AN (the year of the French Republic) in the references given in the bibliographical data. The citation should read: (6), iv, 446, 1801, or some may prefer, An. 6, Vol. iv, p. 446, AN IX (1801). The date of the supposed appearance of the name should be 1801 instead of 1798. Osten Sacken published a note[8] regarding Dumeril's work, which is, apparently, the only detailed reference to this particular article. In this he refers to a special author's edition of the article dated 1798. If such an edition was issued, and the latin terminology is used, we may be able to retain the old, well-established name for this genus. The earliest use of the name *Tetanocera*, in the pure latin form, as a generic name, is by Latreille in 1804.[9] Under the diagnosis of the genus is cited *Musca graminum* Fabricius as the only species. This species is now the genotype of *Dorycera* Meigen (1830) of the Ortalidae, which fact will, unfortunately, exclude the name *Tetanocera* from the Sciomyzidae. There seems to be no other available name for this genus, as at present understood, so I propose *Chaetomacera*, with *Musca elata* Fabricius (1781) as the genotype.

Synopsis of Generic Characters.—In this genus the ocellar bristles are present; the meso- and pteropleura are bare, and the

[7] (3), viii, 651, 1860.

[8] Verh. K. K. Zool.-Bot. Gesell. Wien, l, 450, 1900.

[9] Nouv. Dict. Hist. Nat., xxiv, tab. meth., 196.

lunule not conspicuously protruding, although distinctly visible. The middle femora have one or more median anterior bristles; fore and hind femora have flexor and extensor bristles, and the fifth abdominal segment has well developed marginal bristles. In the known species the general color is honey or wax yellow, with at most mesonotal and pleural stripes of brown, and the apices of tarsi darker; arista black, pubescent or plumose. The wings are infuscated only along the costa and on the posterior cross-vein, and, in two of the more aberrant species, forming a few transverse bars between the veins; but the wings are never distinctly reticulated.

In general appearance the species resemble those of *Dryomyza* and allies, or, in antennal structure, some species of *Melina*. There is, however, no danger of confusion along these lines when note is taken of the absence in this genus of the propleural bristles. The species of *Renocera* have no femoral or abdominal bristles, but otherwise might be confused as allies of *unicolor*.

Key to the Species

1. Wings marked with narrow bars between veins.....2
   Wings immaculate except costal infuscation.....3
2. Marginal cell with distinct fuscous spots.....**valida**
   Marginal cell immaculate except a cloud at apex, rarely with other faint spots.....**clara**
3. Frons with but one frontal bristle; third antennal joint broad apically. **brevis**
   Two frontals present; third antennal joint tapering apically.....4
4. Second antennal joint not as long as broad; small species (5 mm.). **unicolor**
   Second antennal joint as long or longer than broad; larger species (6 to 20 mm.).....5
5. Apices of hind femora distinctly brown; fifth ventral segment of male not visible.....6
   Apices of femora not brown; fifth ventral easily visible.....7
6. Lateral shining frontal stripe not attaining anterior margin of frons. **ferruginea**
   Lateral shining stripes, attaining margin, which is also shining...**silvatica**
7. Middle femora with distinct, stout bristle near apices on posterior side; hind cross-vein generally biangulate or strongly bisinuate.....**vicina**
   Middle femora without such bristle.....**elata**

The species treated here seem to divide into the following, more or less well-marked groups.

valida-group

Second antennal joint short, third tapering; wings maculate. A group of species apparently belonging to this genus, but which are peculiar in having the wings marked with fuscous bars between some of the veins. Contains *valida* and *clara*.

unicolor-group

Second antennal joint short, third tapering; wings immaculate except cloudings at the cross-veins. An unsatisfactory group containing *brevis* and *unicolor*. The latter, except for size, may very easily be confused with some forms of *elata*.

elata-group

Second antennal joint generally elongate, third distinctly tapering, sometimes sharply pointed; wings immaculate excepting the cross-veins and costal margin, and, rarely longitudinally streaked with fuscous between the veins. The typical, and a homogeneous, group, with only two or three well-marked species, containing *elata* with its several forms, *vicina*, *ferruginea*, and *silvatica*.

Chaetomacera valida Loew (Pl. I, fig. 12; pl. II, fig. 30.)

1862. *Tetanocera valida* Loew, Mon. Dipt. N. Amer., i, 110.

This and the following species form a group with maculate wings. The second antennal joint is rather short, usually distinctly broader than long.

♂, ♀. Frons immaculate, the polished orbital stripe extending beyond anterior bristle; wings with fuscous spots in the marginal cell and the hind cross-vein perpendicular. The spots in the marginal cell are probably subject to some variation. Length.—6 to 7 mm.

Specimens Examined.—5 ♂, 8 ♀.

Maine: Capens, July 19; Machias, July 24, (all C. W. Johnson), [all B. S. N. H.].

New Hampshire: Mount Washington, [B. S. N. H.].

Vermont: St. Johnsbury, June 28, (C. W. Johnson), [B. S. N. H.].

Massachusetts: Auburndale, August 1; Bashbish, June 27; Gloucester, August 30, (all C. W. Johnson), [all B. S. N. H.].

Rhode Island: Buttonwoods, June 20, (C. W. Johnson), [B. S. N. H.].

Connecticut: Norwalk, July 9, (I. N. Gabrielson), [Biol. Surv.].

New York: Ellis to Slaterville, June 13, (MacGillivray & J. C. Bradley), [Cornell].

Illinois: (Dr. Lewis), [A. N. S. P.].

Chaetomacera clara Loew (Pl. I, fig. 1.)

1862. *Tetanocera clara* Loew, Mon. Dipt. N. Amer., i, 109.

Dr. Loew, in his description of *T. clara*, states that the frontal orbits have no black spots and that the marginal cell has some small, rather indistinct spots. The specimens I have placed here have the marginal cell immaculate except a spot at the end of the second vein, with only a suggestion, in several specimens, of any other cloud or spot. The frons, usually, has brownish spots at the bases of the frontal bristles and at the apex of the median polished stripe. Therefore, taking into consideration the length of the polished frontal orbits and the oblique position of the posterior cross-vein, the probability is that I am not far wrong in my determination. The series before me is certainly distinct from those under *valida*.

Originally described from Trenton Falls, New York.

Specimens Examined.—6 ♂, 3 ♀.

New Hampshire: Bretton Woods, June 25, (C. W. Johnson), [B. S. N. H.].

Massachusetts: Brookline, June 28, (C. W. Johnson), [B. S. N. H.].

Pennsylvania: Castle Rock, Delaware County, June 3, (C. T. Greene); Glenside, Montgomery County, June 24, (C. T. Greene), [all Greene]. Hazelton, June 29, (W. G. Dietz), [A. N. S. P.].

Maryland: Plummer's Island, June 17, (W. L. McAtee), [Biol. Surv.].

Virginia: Dead Run, July 21, (W. L. McAtee), [Biol. Surv.].

Chaetomacera brevis new species

This species may be confused with some of those of *Renocera*, especially *R. amanda*, but the arista here is very short pubescent. The peculiar narrowing of the frons may be an abnormal development in this specimen.

♂. Frons long as broad; orbits strongly converging, so that at the antennae the frons is only one-half as broad as at the vertex; lateral shining stripe absent, or rudimentary; but one frontal bristle; median shining stripe complete to margin, attenuated; frontal orbits narrowly silvery. Face, in profile, straight, retreating; epistoma not prominent. Cheeks equal to one-third of eye-height. Second antennal joint short, trapezoidal, three times long as broad, not tapering, but broadly rounded apically; arista pubescent, or very short plumose. Mesonotum with two to four narrow brown vitae. Wings immaculate, with cross-veins distinctly fuscous, and longitudinal veins narrowly and faintly clouded; stigma and costa yellow. Length.—3 mm.

Type.—♂; Oswego, New York, August 1, 1895, [U. S. N. M.].

Chaetomacera unicolor Loew

1847. *Tetanocera unicolor* Loew, Stett. Ent. Zeit., viii, 199.

In color and structure similar to *clara* Loew, but the wings are immaculate, with only the cross-veins clouded. Frons rather shining, with the abbreviated stripes polished and not well defined. Second antennal joint nearly as long as third, and as long as broad; third joint conical but rounded. Length, 5 mm.

Originally described from Europe. I have compared my material with European specimens.

I have two males belonging here from Fort Kent, Maine, August 17, (C. W. Johnson), [B. S. N. H.].

Chaetomacera elata Fabricius

1781. *Musca elata* Fabricius Spec. Ins., ii, 441.
1820. *Tetanocera elata* Fallen, Dipt. Suec., Sciomyz., 9.

This species as here considered, is probably a composite, but will give some trouble if any attempt is made to separate it into all of the apparent components. However, there are several forms represented by a few typical specimens, in the material at hand, which it may be worth while noting, and which are considered, at present, as varieties.

The characters, apparently of most value or stability, for this species *sensu latiore*, are the larger size (6 to 8 mm.); broad, quadrate or rectangular second antennal joint; opaque apical margin of frons; long plumose arista; more or less vittate mesonotum, and immaculate wings. In regard to the second antennal joint, most of the varieties are readily distinguished from their closest ally, *unicolor*, but *elata*, typically, is not so easily defined except in its larger size. Hendel,[10] in his description of *elata*, mentions the abdomen having a more or less distinct median stripe. I have not seen any indication of such stripe in our material or in the specimens of European specimens examined. This phase suggests a question as to the possibility of there being two species confused under *elata* in Europe. Our *vicina* has the abdomen vittate, but I hardly think it would prove to be conspecific with the true *elata*. If the type of *elata* could be examined we would be able to satisfy these queries.

The following description is based on specimens from Europe, determined as *elata*, which I can only take as being correctly

[10] Verh. K. K. Zool.-Bot. Gesell. Wien, l, 342, 1900.

named. It is rather full, but the species is considered typical of the genus and group, and other forms will be referred to it with the differential characters alone mentioned.

♂. Cinnamon to honey-yellow; hind femora without brown apices; apices of tarsi generally dark. Wings and veins pale; stigma, costal border to and including apex, fourth vein, and both cross-veins, fuscous. Arista except extreme base, all bristles and setulae, black. Occiput above foramen with or without black spot between two silvery ones. Face with or without brown or black antennal orbital spots.

Opaque; the more or less depressed, darkened, median, and relived orbital stripes of frons, and lunule, polished. Mesonotum more or less shining laterally and faintly bivittate medially. Face and cheeks silvery to yellowish-white, sericeous. Thorax, scutellum, and abdomen, ochraceous pruinose; segments of latter sometimes dark; pleura with a complete brown stripe above.

Frons subhorizontal, slightly produced at antennae; orbital stripes abbreviated; median one complete, but sometimes not quite attaining margin; lunule more or less visible; two reclinate frontal bristles, rather approximate. Face flat or slightly concaved, retreating. First antennal joint visible; second, trapezoidal to rectangular; third, about twice as long as second, roundly or sharply pointed; arista moderately plumose, more dense basally. Scutellum flattened or slightly convex. Fifth abdominal segment as long as fourth; sixth subconical; fifth and especially sixth with long marginal bristles; fifth ventral distinctly visible next to the genital segment. Fore femora with series of about six strong bristles above and a few weak ones below; middle femora with one or two anterior bristles; hind femora with a few upper bristles and two series of flexors; between the latter the surface is densely setulose; no posterior bristle on middle femora. Wings with second to fourth veins parallel; small cross-vein at middle of discal cell; hind cross-vein bowed outwards or straight, but slightly oblique; fourth vein sometimes with appendage in discal cell. Length.—6 to 8 mm.

♀. Similar with usual sexual differences.

The species was originally described from Europe, this being the first American record for the name. Our material has been standing under the name *plebeia* Loew, which is here considered a varietal form. There are several of these varieties or forms of *elata* which may be roughly separated as follows:

Costa, including stigma distinctly infuscated.
Arista densely plumose..... **plebeia**
Arista sparingly plumose..... **elata**
Costa entirely clear or hyaline..... **triangularis**
Costa infuscated apically only..... **rotundicornis**

The median polished frontal stripe varies from short and subtriangular (*triangularis*) to completely and broadly attaining the margin. The second antennal joint varies from trapezoidal

and broad as long, to rectalinear, much longer than broad. Third joint bluntly to sharply pointed. The infuscation of the costa may be entirely reduced (*triangularis*); the reduction beginning in the stigma and marginal cell. The varieties noted are briefly diagnosed below, but there seems to be much intergradation between them. More exhaustive study, with large series of specimens from all possible localities, may throw some light upon the limits of this species.

Chaetomacera elata variety **rotundicornis** Loew

1861. *Tetanocera rotundicornis* Loew, Berl. Ent. Zeit., v, 344. (Cent. i, 70.)

I have a few specimens which may be located under this name. They could be confused with *unicolor*, but the antennae are more like *elata*, and the mesonotum faintly vittate. They differ from *elata* in having only the apical portion of the costa infuscated.

Originally described from both sexes from English River, Canada, (Kennicott). I have examined a male from Glen House, New Hampshire, July 8, 1914, (C. W. Johnson), [B. S. N. H.]; also a pair from Connecticut, (Williston).

Chaetomacera elata typical form

Second antennal joint hardly longer than broad, rarely broader; third, bluntly pointed apically, but not broadly so; arista scarcely more densely plumose basally than beyond, with extreme base pale. Antennal orbital spot absent or pale brown, rarely darker. The median polished stripe narrowed anteriorly and rarely attaining margin except in the female. Lateral margins of mesonotum at most slightly shining. Wings with costal margin entirely infuscated, with sometimes faint streaks between the veins.

Specimens Examined.—8 ♂, 6 ♀.

New Hampshire: White Mountains, (C. U. Lot. 35, Cornell U. Lot. 60, Sub. 193), [Cornell].

Vermont: Burlington, June 24, (C. W. Johnson), [B. S. N. H.].

Connecticut: (Williston), [A. N. S. P.].

New York: Ithaca, June to August, [Cornell].

District of Columbia: Chain Bridge, June 12, (W. L. McAtee), [Biol. Surv.].

Chaetomacera elata variety **plebeia** Loew (Pl. I, fig. 3; pl. II, fig. 31.)

1862. *Tetanocera plebeia* Loew, Mon. Dipt. N. Am., i, 120.

Probably inseparable from typical *elata*, but considering the more densely plumose arista as described by Loew, we may retain the name for those specimens possessing this character. The series examined show some deviation from the original descrip-

tion in other respects, especially in the form of the median frontal stripe which I find is more generally broad and complete than narrow and incomplete, as is the rule with typical *elata*. Loew recognized the similarity to typical *elata*, but the differential characters he gives, except in regard to the arista, seem unimportant. This form, however, seems to be our common representative of the *elata* assemblage, but I do not consider it a distinct species. The following description may assist in distinguishing this variety.

Mesofrontal shining stripes broad, complete; lunule generally visible, especially of the male; second antennal joint rather robust, longer than broad; third joint long and conically pointed; arista densely plumose, especially towards the base; its extreme base is also black, sometimes discoloring that part of the joint. Antennal orbital spot dark, often velvety black. Lateral mesonotal area shining, lighter in color than the opaque, setulose region just above. The infuscation of the wings sometimes extended into longitudinal streaks between veins.

Originally described from specimens of both sexes from the Middle States.

A female from Tahoe, Lake Tahoe, California, August 30, 1910, altitude 6300–7000 feet, [A. N. S. P.], has the arista evenly and very densely plumose, with the hairs shorter than usual, the hind cross-vein is more oblique and the antennal orbital spot very distinct and black. This form may be a distinct variety limited to a more boreal or alpine distribution.

Specimens Examined.—44 ♂, 65 ♀.

Canada: Carbonate, Columbia River, British Columbia, 2600 ft. alt., June 7–12, (J. C. Bradley); Britannia, Ontario, September 8, [all Cornell].

Maine: Capens, July 19; Eastport, July 14; Princeton, July 12, (all C. W. Johnson), [all B. S. N. H.].

Vermont: St. Albans, June 19, (C. W. Johnson), [B. S. N. H.].

New Hampshire: Bretton Woods, June 25; Glen House, June 16, (all C. W. Johnson), [all B. S. N. H.].

Massachusetts: North Adams, June 18, (C. W. Johnson), [B. S. N. H.].

Connecticut: Norwalk, July 9, (I. N. Gabrielson), [Biol. Surv.].

New York: Ellis to Slaterville, June 13, (MacGillivray & Bradley); Dryden Lake, Tompkins County, June 16, (MacGillivray & Bradley); Ithaca, May–August; McLean, July 2–3; Mud Creek, Tompkins County, June 17–20; Lake Mahopac, June 25, (J. O'Connor); Slatervilie to Caroline, June 14, (MacGillivray & Bradley), [all Cornell].

Pennsylvania: Swarthmore, May 23 to June 22, (Cresson), [A. N. S. P.].

District of Columbia: Chain Bridge, June 12, (G. M. Greene), [A. N. S. P.].

Colorado: Grant, Denver Park, 9500–10,000 ft. alt., July 27, (L. O. Jackson), [Biol. Surv.].

? New Mexico: Fort Wingate, July 25, (J. Woodgate), [A. N. S. P.].

Chaetomacera elata variety **triangularis** Loew

1861. *Tetanocera triangularis* Loew, Berl. Ent. Zeit., v, 344. (Cent. i, 69.)

? 1881. *Tetanocera montana* Day, Can. Ent., xiii, 87.

The wings here have no infuscation along the costa, the third antennal joint is more pointed, the mesonotal stripes distinct, the median frontal stripes abbreviated.

Described from a male from English River, Canada, (Kennicott).

This form probably includes specimens having the costa more or less infuscated apically. I have seen the following material which may be considered typical.

Specimens Examined.—4 ♂, 5 ♀.

Canada: Carbonate, Columbia River, British Columbia, July 7–12, (J. C. Bradley), [Cornell]; Toronto, Ontario, May 5, [Johnson].

New York: Ithaca, May to August, [Cornell].

Chaetomacera vicina Macquart (Pl. I, fig. 7; pl. II, fig. 28.)

1843. *Tetanocera vicina* Macquart, Dipt. Exot., ii, (3), 180, pl. 24, f. 7.

1847. *Tetanocera plumosa* Loew, Stett. Ent. Zeit., viii, 201, (Sitka).

1849. *Tetanocera struthio* Walker, Br. Mus. List, iv, 1086, (Canada).

This species is at present known under Loew's name and has always been confused with *plebeia*. It is, however, very distinct and easily distinguished by the presence of the characteristic femoral bristle. *Tetanocera vicina* Macquart and *Pherbina vicina* Desvoidy (1830) are not homonyms, as considered by Loew.[11] Therefore Macquart's name has priority over Loew's *plumosa*.

♂, ♀. In structure and general appearance similar to *plebeia*, but in color somewhat darker. Abdomen with a more or less distinct median stripe of brown; orbital spot at antennae usually distinct, black; second antennal joint robust, about three times as long as third; pleural stripe distinct; middle femora with a distinct bristle on posterior surface near apex; hind cross-vein strongly arcuate and often angularly bent. Length.—6 to 9 mm.

This species was originally described from Philadelphia. I have examined specimens from California and they show but little variation from those from the Atlantic region. However, there are some forms in the series examined that suggest possible varieties, but I do not attempt to separate them now.

[11] Monograph, i, 122.

Specimens Examined.—48 ♂, 66 ♀.

CANADA: Downie Creek, Selkirk Mts., British Columbia, August 9, (J. C. Bradley), [Cornell].

VERMONT: Burlington, June 22; St. Johnsbury, June 27, (all C. W. Johnson), [all B. S. N. H.].

MASSACHUSETTS: Brookline, August 23; (C. W. Johnson); Cohassett, August to September, (O. Bryant); Mt. Greylock, June 8, (C. W. Johnson), [all B. S. N. H.].

CONNECTICUT: Hartford, August 31, [A. N. S. P.].

NEW YORK: Alexandria Bay, September 3; Clifton Springs, August 14; Ithaca, May to September; McLean, May 31 to July 2–3; Malloryville, Tompkins County, June 18–20, (MacGillivray & Bradley); Mud Creek, Tompkins County, June 17–20, (MacGillivray & Bradley); Slaterville to Caroline, June 14, (MacGillivray & Bradley), [all Cornell]. Aqueduct, Long Island, September 12; Pine Lawn, Long Island, June 16, (all W. T. Davis), [all Davis].

PENNSYLVANIA: Hazelton, August 31, (W. G. Dietz); McConnellsburg, Fulton County, June 4; Lansdale, July 8, (Cresson); Swarthmore, June 1 to September 3, (Cresson), [all A. N. S. P.].

MARYLAND: Branchville to Beltsville, June 4, (L. O. Jackson), [Biol. Surv.].

VIRGINIA: Dyke, May 25, (W. L. McAtee); Glencarlyn, to mouth of Fourmile Run, June 17, (W. L. McAtee), [all Biol. Surv.].

WEST VIRGINIA: Fairmont, June 22, (Cresson), [A. N. S. P.].

ILLINOIS: Lake Forest, July 8, (J. G. N.), [Cornell].

WISCONSIN: Dane County, October, (W. S. Marshall), [Davis].

MISSOURI: Columbia, May 26 to June 8, (C. R. Crosby), [Cornell].

NEW MEXICO: Beulah, June 29, (Viereck), [A. N. S. P.].

UTAH: Bountiful, August 2, (A. Wetmore), [Biol. Surv.].

CALIFORNIA: Colton, July 17, (C. F. Baker); Gazelle, September 4; Yosemite Valley, August 10, (all C. F. Baker), [all Johnson]. Echo Lake, Siskiyou County, August 29, (J. A. Kusche), [A. N. S. P.].

MEXICO: Guadalupe, D. F., September 5, (W. L. Tower), [Johnson].

Chaetomacera ferruginea Fallen

1820. *Tetanocera ferruginea* Fallen, Dipt. Suec., Sciom., 9.

From the basis of the European specimens examined, under this name, I find the species represented in our fauna. That it should be considered distinct from *elata* seems warranted, judging from the general habitus. It is larger, rather more robust, darker in color, by which, with the dark apices of the hind femora and the retraction of the fifth ventral segment of the male, it may be readily distinguished from that species.

♂, ♀. The meso-frontal shining stripe complete; lunule generally free. Second antennal joint large; third tapering to a broadly rounded apex. Lat-

eral mesonotal area generally opaque, dusted, more so than the setulose area above; median stripe generally distinct. Apices of hind femora distinctly infuscated. In the male the fifth ventral segment is not visible on account of the fifth dorsal closing around the base of the genital segments. Costa not clouded, at most faintly so at and beyond second vein; stigma rarely pale; rarely any fuscous streaks in first or second posterior cells. Length.—8 to 10 mm.

Specimens Examined.—3 ♂, 5 ♀.

Canada: Britannia, Ontario, September 8, [Cornell].

New York: Ithaca, May to August, [Cornell].

Chaetomacera silvatica Meigen

1830. *Tetanocera silvatica* Meigen, Sys. Besch., vi, 41.

This species, originally described from Europe, is apparently represented in our fauna. I have compared specimens and can see no reason for doubting their specific relation.

♂. Similar to *ferruginea*, but the lateral shining frontal stripes complete, and the anterior frontal margin also shining. The costal margin of the wings faintly infuscated, but the stigma is yellow. Not so large as *ferruginea*, but more of the build of *elata*.

But one, the following female, has been examined from our fauna: Aweme, Manitoba Canada, June 24, (E. Criddle).

POECILOGRAPHA Melander

1913. *Poecilomyia* Melander, Psyche, xx, 58, [nec Hendel, 1911].

1913. *Poecilographa* Melander, Psyche, xx, 205.

A well marked genus, based on the anomalous *Sapromyza decora* Loew. In the shape of the head there is a similarity to *Chaetomacera valida* and its allies, but in the present genus the epistoma is more prominent. Further generic characters may be found in the absence of propleural bristles; scutellum with four bristles; frons with a broad, convex, polished, median area which includes the ocelli and their bristles, and is separated from the orbits by a distinct grove; four frontal orbitals; second antennal joint as broad as long; third, as broad as second, sharply pointed; arista black plumose; three dorso-centrals and the presentellar pair, present; meso- and ptero-pleura setulose. Wings fuscous, with numerous clear whitish spots.

Poecilographa decora Loew (Pl. I, fig. 11; pl. II, fig. 29.)

1864. *Sapromyza decora* Loew, Berl. Ent. Zeit., viii, 97. (Cent. v, 96.)

A species conspicuous in being pale yellow, marked with large, regularly arranged dark brown or black spots on the thorax and

abdomen. The frons with the convex polished median area, black. Wings as figured (fig. 11). Length.—4 to 5 mm.

Originally described from a female from Lake George, New York, (Osten Sacken), [Mus. Comp. Zool.?].

Specimens Examined.—4 ♂, 11 ♀.

New York: Ithaca, June 25–August 2; McLean, June 20–July 2–3; Mud Creek, June 17–20; Slaterville to Caroline, June 14; Woodwardia Bog; [all Cornell].

Pennsylvania: Swarthmore, June 11–August 3, (Cresson), [A. N. S. P.].

Illinois: [A. N. S. P.].

TRYPETOPTERA Hendel

1900. Hendel, Ver. K. K. Zool.-Bot. Ges., Wien, I, 352.

The species of this genus differ from those of *Limnia* in that the excavated polished frontal stripe is wanting, or only a faint grove or grayish line is indicated in its place. In this respect they should not be confused with those of *Hoplodictya* or *Monochaetophora*. The former has the anterior frontal bristle proclinate and the prescutellars absent. The latter has but one frontal bristle and the legs conspicuously banded with brown. The lateral denuded area of the second antennal joint, in this genus, is opaque, not polished as in *Limnia*, and there are two bristles on the upper margin; the arista is black plumose.

Genotype.—*Musca punctulata* Scopoli (1763), by original designation.

Trypetoptera pallida Loew (Pl. I, fig. 17; pl. III, fig. 32.)

1859. *Tetanocera pallida* Loew, Wien. Ent. Monat., iii, 294.

In our only known species of this genus the eyes are horizontal; frons opaque, wax yellow; frontal orbital spot reduced; second and third antennal joints short, the latter rather equilaterally triangular in shape, opaque, with whitish pubescence, more or less rounded apically. Wings with marginal cell infuscated, with six or more clear spots which do not attain the costa. Otherwise in the wing design and general habitus the species is similar to *Limnia combinata*. Length.—4 to 6 mm.

This species is under *Tetanocera canadensis* Macquart in most collections, but I cannot consider the synonymy as established from Macquart's description or figures.

Originally described from Washington, D. C.

Specimens Examined.—12 ♂, 12 ♀.

VERMONT: Norwich, July 2, (C. W. Johnson), [B. S. N. H.].

NEW YORK: Ithaca, July, [Cornell].

NEW JERSEY: Medford, August 12, [A. N. S. P.].

PENNSYLVANIA: Hazleton, August 28, (W. G. Dietz), [A. N. S. P.]. McConnellsburg, Fulton County, June 4, [A. N. S. P.].

MARYLAND: Plummer's Island, June to August; Near Plummer's Island, May to July; (all W. L. McAtee), [all Biol. Surv.].

VIRGINIA: Great Falls, May 19–23, (W. L. McAtee), [Biol. Surv.].

ILLINOIS: [no other data], [A. N. S. P.].

UTAH: Salt Lake City, July 22, [Johnson].

COLORADO: (C. F. Baker, 2220), [Johnson].

HOPLODICTYA new genus

Similar to *Monochaetophora*, but the frons has two fronto-orbital bristles, of which the anterior one is proclinate and situated farther from the orbit than the posterior one. The second antennal joint has two stout bristles above; there are three to four dorso-centrals; the prescutellar bristles are absent; sternopleura with one bristle.

Head higher than long, as broad as high. Eyes obliquely ovate, with facial orbits straight. Frons horizontal with two orbitals, in series converging anteriorly; the anterior bristle proclinate, the posterior one reclinate. Mesofrontal stripe not evident except as a slightly excavated line. Face vertical, broad, slightly concaved; epistoma slightly prominent. Cheeks broad. Lunule retracted, second antennal joint broad with lateral bare area subopaque; third joint as long as second, deeply concaved above, attenuating to a truncate apex; arista loosely plumose, black. Scutellum broad, flat, with four bristles. Meso- and pteropleura with few bristles. Fourth abdominal segment of male usually shorter than the third or fifth.

Genotype.—*Tetanocera setosa* Coquillett.

I know of three species belonging here, which may be distinguished as below. They should not be confused with those of *Trypetophora*, which have both frontal bristles reclinate and a distinct prescutellar pair.

Femora annulated with brown; abdomen with three stripes. . . . . **spinicornis**
Hind femora with submedian spot alone; dorsum of abdomen uniformly brown with pale lateral margins. (Bermuda species) . . . . . **kincaidi**
Femora entirely immaculate, pale . . . . . **setosa**

Hoplodictya setosa Coquillett (Pl. III, fig. 35.)

1901. *Tetanocera setosa* Coquillett, Proc. U. S. Nat. Mus., xxiii, 615.

♂, ♀. Wax yellow; mesonotum and scutellum faintly striped; abdomen with faint median stripe or none. Legs immaculate, except the dark apices of tibiae and of tarsi. Proclinate fronto-orbital very weak. Wing infuscation dilute yellowish. Third antennal joint somewhat longer than second. Length.—6 mm.

Described from a cotypic series from Massachusetts and Georgia.

Specimens Examined.—1 ♂, 2 ♀.

Massachusetts: Cohasset, September 8; Edgartown, June 29, [all B. S. N. H.]. Ipswich, July 22, (E. P. VanDuzee), [VanDuzee].

Hoplodictya spinicornis Loew

1865. *Tetanocera spinicornis* Loew, Berl. Ent. Zeit., ix, 181. (Cent. vi, 86.)

♂, ♀. Brownish, variegated with darker and grayish marks. Mesonotum and scutellum distinctly striped; abdomen with distinct median and lateral stripes. Fore femora grayish with irrorations and oblique basal, submedian and subapical rings of brown; middle and hind femora yellow with basal, and submedian brown rings; tibiae with distinct brown apices. Wings infuscated with dark brown. Frons longer than broad; second antennal joint as long or longer than third. Length.—3 to 4 mm.

This species should not be confused with *Monochaetophora umbrarum*, which has a distinct pair of prescutellars but no anterior frontal bristle.

Originally described from the female sex from Cuba (Gundlach). It is apparently well distributed southward.

Specimens Examined.—9 ♂, 5 ♀.

Maryland: Chesapeake Beach, June 18, (L. O. Jackson), [Biol. Surv.].

Florida: Brickell's Hammock, Miami, March 5, (M. Hebard; mangrove swamp), [A. N. S. P.]. Point Antonio, April, [Johnson]. St. Augustine, March 14, [Johnson].

Texas: Dallas, May 7 to June 18, (W. D. Pierce, C. R. Jones, E. S. Tucker); Galveston, March 17, (E. S. Tucker); Victoria, June 21, (J. D. Mitchell); [all U. S. N. M.].

Nevada: Steamboat, September 3, (H. G. Dyar), [U. S. N. M.].

California: Alpine, April 10; Los Angeles, April 1; Palo Alto, June 31; (all M. C. VanDuzee), [all VanDuzee].

MONOCHAETOPHORA Hendel

1900. Hendel, Verh. K. K. Zool.-Bot. Gesell., Wien, l, 355.
? 1803. *Dictya* Meigen, Ill. Mag., ii, 277.

This genus, at present, contains but one species, which seems to be common to both Europe and North America. There will be no trouble in recognizing this species which is thickly irrorated with

brown and the wings peculiarly marked as is shown in figure 8. Care, however, should be taken not to confuse it with species of *Hoplodictya*.

Genotype.—*Musca umbrarum* Linné (1758). [Monotypic.]

Eyes vertically oval. Frons attaining bases of antennae; lunule not prominent, with one orbital bristle; mesofrontalia linear, sometimes scarcely discernible; lunule not prominent. Second antennal joint quadrate; third, broad as long, triangular, truncate apically; arista sparsely black plumose. Sternopleura setulose. Wings spotted with white and brown; third and fourth veins parallel.

The name *Monochaetophora* was proposed for a genus having *Musca umbrarum* Linné as its type species, and, as a genus, replaces *Dictya* Meigen (1803) of some authors. The latter genus, as considered by recent authors, is erroneously based on *Musca umbrarum* Linné (1758), instead of *M. umbrarum* Fabricius, the latter, not the former, being one of the originally included species. In Meigen's original diagnosis of *Dictya*, two species are cited thus: "*Musca cucularia*, *umbrarum* Fabr." These two were there credited to Fabricius, although the names were first used by Linné and so credited by Fabricius; but Meigen, following the custom of the early authors, referred to Fabricius even for Linné's species. In this case, however, Fabricius, apparently, did not know or misidentified Linne's species. There is nothing in the original diagnoses of *M. umbrarum* Linné or of *M. umbrarum* Fabricius, to guide one in assuming that Meigen had either of these species before him at the time he proposed *Dictya*. That the above names apply to distinct species may be satisfactorily demonstrated, by comparing *Musca* (*Monochaetophora*) *umbrarum* Linné and *Musca* (*Platystoma*) *umbrarum* Fabricius with the two original diagnoses. The snow white face (fronte) in the former, and the grayish, brown banded, abdomen in the latter, may be considered sufficient characters of distinction. It may thus be assumed, and it is generally recognized, that Fabricius was in error in his determination of Linné's species. Now upon comparing specimens of the two species above noted, with Meigen's diagnosis of *Dictya*, we find that it calls for porrect antennae, of three joints; the first small; second flat, elongate; third flat with superior margin excavated, with basal, plumose arista; frons

broad; wings parallel. It is evident that *umbrarum* Linné will agree, but that *umbrarum* Fabricius, which species has the arista bare, and the antennae pendent, of entirely different structure, will not. It is also evident, on similar comparison, that neither *cucularia* Linné (1766) nor *cucularia* Fabricius (1775) which have, at most, only pubescent arista, are referred to.

The logical conclusion is that Meigen did base his genus on *M. umbrarum* Linné (1758), but unfortunately crediting it to Fabricius. As but one of the originally included species can be considered the genotype, it becomes necessary to consider so either *cucularia* Fabricius or *umbrarum* Fabricius. Of these two, *cucularia* is synonymous with *Musca* (*Hedroneura*) *rufa* Panzer (1798) not *cucularia* Linné (1766), and *umbrarum* is synonymous with *Musca* (*Platystoma*) *fulriventris* Gmelin (1788). Thus *Dictya* becomes synonymous with *Platystoma* Meigen (1803), [Ortalidae], with the former having priority on the same page of Meigen's work.

This will clear up the situation and explain the use of *Monochaetophora* Hendel (1902). Regarding *Statinia* Meigen (1800), little need be said. I do not approve of Meigen's 1800 paper being accepted, but in this case, the name cannot replace *Monochaetophora* or *Dictya*. Latreille (1802) was the first to associate a species under *Statinia*, this being *Musca marginata* Fabricius, now referred to *Coremacera* Rondani (1856). On the whole the validation of genera without species is an absolute injustice to binomial nomenclature. There would be less dissatisfaction and more stability if all non-represented genera were to be invalidated and considered as nomina nuda or unrecognizable names.

Monochaetophora umbrarum Linné (Pl. I, fig. 8.)

1758. *Musca umbrarum* Linné, Syst. Nat., (x), 599.
1820. *Tetanocera umbrarum* Fallen, Dipt. Suec., Sciomyz., 7.
1859. *Tetanocera pictipes* Loew, Wien Ent. Monat., iii, 292.

Tawny, variegated with black and brown. Opaque species, ochreous above to cinereous below, with large and small brown spots on the head, body and legs. Wings grayish hyaline with brown areas enclosing white spots, most intense along the costa. Face concaved in profile, snow-white or yellowish white with a median black spot. Femora annulated, and tibiae apically, black. Length.—4 to 6 mm.

Originally described from Europe. On comparing our material with some specimens from Europe, I cannot detect any differential characters of specific or even varietal importance.

Specimens Examined.—58 ♂, 49 ♀.

Canada: Aweme, Manitoba, June 24, (E. Criddle), [Criddle]. Rigaud, July 27, [Johnson].

Massachusetts: Wellesley, August 15, [B. S. N. H.].

Connecticut: Middletown, June 17, (C. W. Johnson); New Haven, October 18, (C. M. Allen), [all B. S. N. H.].

New York: Clifton Springs, August; Ithaca, June; Woodwardia Bog, Tompkins County; Ellis to Slaterville, June; Slaterville to Caroline, June; Malloryville, Tompkins County, June, [all Cornell].

New Jersey: Leonia, May 15, (E. R. Kalmbach), [Biol. Surv.]. Riverton, June 15, [A. N. S. P.].

Pennsylvania: Lansdale, May 16; Swarthmore, July 28, (all Cresson), [all A. N. S. P.].

Maryland: Beltsville, September 10; Plummer's Island, April 20; Near Plummer's Island, September 29; (all W. L. McAtee), [all Biol. Surv.]. Chain Bridge, Montgomery County, September 24, (L. O. Jackson; on flowers of *Pontederia cordata*), [Biol. Surv.].

District of Columbia: Eastern Branch near Benning, August 29, W. L. McAtee), [Biol. Surv.].

Virginia: Dyke, May 28 to July 16, (W. L. McAtee); Great Falls, August 1; Great Falls to Difficult Run, July 25; Maywood, Alexandria County, June 2; (all W. L. McAtee), [all Biol. Surv.].

North Carolina: Hertford, June 9, [Johnson].

Georgia: Silver Lake, Fulton County, August 10; St. Simon Island, April 22 to May 12, (J. C. Bradley); Thalman, April 8; [all Cornell].

Florida: Miami, February 10, [A. N. S. P.]. St. Petersburg, August 12, (J. C. Bradley), [Cornell].

Louisiana: Vinton, 14 miles south, September 7, (E. G. Holt), [Biol. Surv.].

Illinois: Northern, [A. N. S. P.].

Kansas: (E. W. G.), [A. N. S. P.].

Dakota: [A. N. S. P.].

Nebraska: Fremont, [Cornell].

Colorado: Grant, Geneva Park, 10,000 feet alt., August 19, (E. C. Jackson), [Biol. Surv.].

Washington: Mt. Rainier, October 14, (L. O. Jackson), [Biol. Surv.].

Texas: Round Mountain, [A. N. S. P.].

Arizona: [A. N. S. P.].

California: Berkeley Hills, April 11, (E. T. Cresson), to September 19, (J. C. Bradley), [A. N. S. P. and Cornell]. Pacific Grove, October 7, (J. C. Bradley), [Cornell]. Redwood Canyon, Marin County, May 17, (Cresson), [A. N. S. P.].

Mexico: Guadalajara, September 6, (McClendon), [A. N. S. P.].

Costa Rica: Cartago, May 17, and October 7, (P. P. Calvert; along ditch); Near San Isidro, August 21, (P. P. Calvert; near river), [all A. N. S. P.].

Variation.—There is some variation in the size and in the number of clear spots along the veins in the wings. The wings having the spots small and more numerous seem to occur mainly in the western specimens. The maculation pattern shows very little variation.

Tribe *Euthycerini*

The genera of this tribe are characterized by the white, bare or plumose arista, and the scutellum with four bristles. The Sepedontini also has the arista white, but with only two scutellar bristles. The antennae in the present tribe are generally stout, with the second joint broad and rectangular. In *Dictyomyia* we have an aberrant genus which probably represents another group. It is placed in this tribe for convenience, as I do not think it advisable to propose another tribe on the present knowledge of its relationship.

EUTHYCERA Latreille

1829. Latreille, Cuvier, Reg. Anim., v, 529.
1900. *Lunigera* Hendel, Verh. K. K. Zool.-Bot. Gesell.; Wien, l, 344.

Latreille erected this genus for species allied to *Scatophaga chaerophylli* Fabricius. The original citation refers to this species by name, so that the genus is perfectly valid and has for its genotype *Musca caerophylli* Fabricius. It was originally considered, and is, as now understood, very distinct from the *Tetanocera* of authors. *Lunigera* Hendel was based on the same species, *Euthycera* being apparently overlooked by that author.

Similar in general aspects to *Chaetomacera*. Head longer in proportion to its height; frons horizontal; lunule exerted, with a prominent, sharp, carina between the antennae. In the known species there is no lateral, polished, frontal stripes. Second antennal joint rectangular, bare on lateral upper surface; arista white pubescent or plumose. Mesonotum irrorated; sternopleura setulose. Squamae black ciliate. Wings fuscous, reticulated, sometimes densely so with quadrate white spots; small cross-vein before middle of discal cell. Fifth abdominal segment of male much shorter than fourth.

Genotype.—*Musca chaerophylli* Fabricius. [Monotypic.]

There are apparently two species and several varieties represented in our fauna. These two species may be separated as follows:

The diluted spot in marginal cell quadrate and regular; those in the submarginal and first posterior cells rounded ..... **borealis**

Diluted spots irregular in shape and arrangement, generally quadrate and very numerous ..... **arcuata**

Euthycera arcuata Loew (Pl. I, fig. 13; pl. III, fig. 34.)

1859. *Tetanocera arcuata* Loew, Wien. Ent. Monat., iii, 292.

♂, ♀. Tawny; lunule, broad pleural stripe, fore femora basally, fore tibiae apically, two apical tarsal joints, brown to black. Basal two tarsal joints white. Wings densely reticulated with spots which are rather irregular in the marginal and submarginal cells. Opaque species, with the excavated median frontal stripe shining and the lunule polished. Scutellum and legs more or less shining. Occiput, vertex, and frontal orbits, whitish dusted, with black spots at bases of bristles, and an elongate velvety black spot at the anterior fronto-orbital bristle, and another black spot between antennae and eyes. Face and cheeks silvery. Mesonotum irrorated with brown dots and with dorso-central series of rather distinct brown spots. Scutellum brown, somewhat shining, yellow dusted, with margin velvety black except at apex, which has a silvery spot.

Face retreating and convex in profile; second antennal joint as broad as third. Length.—4.5 to 8.5 mm.

Originally described from Washington, D. C., (Osten Sacken).

Specimens Examined.—21 ♂, 16 ♀.

New York: Ithaca, July to August, [Cornell]. Mud Creek, Tompkins County, June 16–20, (MacGillivray and Bradley), [Cornell].

New Jersey: Haddonfield, [A. N. S. P.].

Pennsylvania: Philadelphia, June, [Cornell]. Fairmount Park, Philadelphia, May 30, (F. Haimbach), [A. N. S. P.]. McConnellsburg, Fulton County, June 4, [A. N. S. P.]. Hazleton, June 10, (W. G. Dietz), [A. N. S. P.]. Swarthmore, June to July, (Cresson), [A. N. S. P.].

Maryland: Beltsville, June 14; Plummer's Island, June 7; Near Plummer's Island, June 2 to July 4, (all W. L. McAtee); Branchville to Beltsville, June 4, (E. R. Kalmbach), [all Biol. Surv.].

Virginia: Dead Run, July 2, (W. L. McAtee); Great Falls, May 19 to June 30 (W. L. McAtee) to July 2, June 30 (A. Wetmore), [all Biol. Surv.].

Illinois: [no other data; A. N. S. P.].

Variations.—There is a variety before me of which an extreme form is represented by females having the fore femora almost entirely darkened, the whitish wing spots very numerous and small, forming three or four longitudinal series in the submarginal

and first posterior cells. This form, however, does not hold constant in these characters, but intergrades nicely with some specimens I have included in the typical series. In fact, some of the males in the typical series have the finely reticulated wings of this form, but the femora are not so noticeably darkened. However, I have two females from Capens, Maine, (C. W. Johnson), [Boston], which have the finely reticulated wings, but one has the femora darkened, while the other has them entirely pale. It is noticeable, in all forms, as a rule, that the darker the legs, the finer the reticulation, and that the females are always darker than the males.

Of this variety I have selected five females from the following localities:

MARYLAND: Beltsville, June 18; Cabin John Bridge, July 29; Forest Glen, May 30; Near Plummer's Island, July 4, (all W. L. McAtee), [all Biol. Surv.].
NEBRASKA: Fremont, [A. N. S. P.].

Euthycera arcuata variety **uniformis** new name

1847. *Tetanocera flavescens* Loew, Stett. Ent. Zeit., viii, 123, (nec Desvoidy, 1830).

This form I consider a variety of *arcuata*, differing essentially only in the few characters mentioned below. That it is *flavescens* of Loew may be questioned, but Loew's name must fall anyway.

♂, ♀. Second antennal joint longer and somewhat broader than the third; face retreating, but slightly concaved; spots in the marginal cell large, few, generally quadrate, but not equally spaced, seldom triangular; fore femora entirely yellow; tibiae infuscated only at extreme apices. Length.—7 to 8 mm.

Specimens Examined.—3 ♂, 7 ♀.
NEW YORK: Ithaca, June to July, [Cornell].
MARYLAND: Cabin John, July 29, (W. L. McAtee), [Biol. Surv.].
VIRGINIA: Snicker's Gap, Bluemont, June 22, (A. Wetmore), [Biol. Surv.].

Euthycera borealis new species

This form will need more study. It seems fairly well differentiated from the others, and is probably strictly boreal in its distribution. There is apparently nothing by which the individuals from New England may be separated from the North Carolina series.

♂, ♀. Similar to *uniformis* but smaller, paler in color. Head more produced triangularly; second antennal joint not so long as third and narrower. Wings longer in proportion to their width, and the spots in the marginal

cell quadrate and regular, while in the submarginal and first posterior cells they are rounded and arranged regularly in two series, each along the veins. Length, 4 to 5 mm.

Type.—♂; North Fork of Swannanoa River, Black Mountains, North Carolina, May, (W. Beutenmüller), [A. N. S. P., Type no. 6223]. *Paratype.*—1 ♂, topotypical.

Specimens Examined.—2 ♂, 4 ♀.

Maine: Capens, July 21, (C. W. Johnson), [B. S. N. H.].

New Hampshire: Bretton Woods, June 25; Mount Washington, 2500 ft. alt., July 24; Half-Way House, Mt. Washington, July 6, (all C. W. Johnson), [all B. S. N. H.].

North Carolina: North Fork of Swannanoa River, Black Mountains, (W. Beutenmüller), [Johnson].

LIMNIA Desvoidy

1830. Desvoidy, Myod., 684.

In this genus the median frontal stripe is broad, excavated and polished; the lunule retracted but distinguishable between the antennae; second joint robust, quadrate; third triangular, pointed; arista white plumose, with rather short hairs. Mesopleura setulose. Ocellar bristles present. The wing design consists of transverse fuscous spots or bars between the veins and which are connected by a more or less distinct longitudinal, fuscous stripe running along the middle of the cells; the marginal cell is sometimes entirely infuscated.

Genotype.—Limnia limbata Desvoidy [syn. *Musca unguicornis* Scopoli (1763)], [present designation].

The following species are known to me from our fauna:

Praescutellar bristles absent; scutellum uniformally yellow..... **costalis**
Praescutellar bristles present.
  Scutellum uniformally yellow; marginal cell infuscated, with small round spots..... **shannoni**
  Scutellum with dark spot on disk.
    Marginal cell entirely, or broadly infuscated along costa; eyes horizontal.
      Second antennal joint with at most three bristles above. **saratogensis**
      Second joint with at least five such bristles..... **pubescens**
    Marginal cell with separated infuscated spots; eyes round.. **combinata**

Limnia combinata Loew (Pl. I, fig. 9.)

? 1830. *Tetanocera bosci* Desvoidy, Myod., 608.
1859. *Tetanocera combinata* Loew, Wien. Ent. Monat., iii, 295.

This is a very distinct species, although in general similar to *saratogensis*. It differs, however, in having the marginal cell marked with widely separated fuscous spots; not infuscated along the costa. In some intensely colored specimens the spots coalesce somewhat, but there is no tendency to become actually infuscated along the costa. The transverse bars are broader than in *saratogensis*, but sometimes dividing into pairs, or they are sometimes fused into broad spots completely crossing the cells. Generally these bars are narrow and irregularly arranged, and the median longitudinal streak is always evident. The clear areas are quadrate. The mesonotum is distinctly striped; the dark median and the two gray stripes extend to and upon the scutellum. Praescutellar bristles well developed. Second antennal joint robust, sometimes longer than broad, and may be longer than third. Dorsum of abdomen generally with a distinct median fuscous stripe. Length.—5 to 7 mm.

Originally described from Philadelphia. This species will be found in some collections under *T. bosci* Desvoidy. Loew, in his monograph,[12] says Desvoidy's description is unrecognizable. I do not care to contest this assertion.

Specimens Examined.—23 ♂, 19 ♀.

Canada: Sandford, Ontario, June 19, (C. R. Crosby), [Cornell].

Maine: Machias, July 20, (C. W. Johnson), [B. S. N. H.].

Massachusetts: Horseneck Beach, July 30, (C. W. Johnson), [B. S. N. H.].

Connecticut: [no data].

New York: Clifton Springs, August 14; Dryden Lake, Tompkins County, June 16; Ellis to Slaterville, June 13; Ithaca, July to August; McLean, June to July; Malloryville, June 18–20; Mud Creek, Tompkins County, June 17–20; Slaterville to Caroline, June 14; [all Cornell].

New Jersey: [no other data], (Williston).

Pennsylvania: Bryn Mawr, June 4; McConnellsburg, Fulton County, June 4; Swarthmore, July 11, (Cresson); [all A. N. S. P.].

Maryland: Glymont, May 25, (C. W. Johnson), [B. S. N. H., and Johnson].

Virginia: Dyke, May 28, (W. L. McAtee); Wallop's Island, June 1, (W. L. McAtee), [Biol. Surv.].

North Carolina: Hertford County, June 9, [Johnson].

Montana: Beaver Creek, 6300 feet alt., August, (S. J. Hunter), [Kansas].

Colorado: Grant, Geneva Park, 9500–10,000 feet alt., June 22, (L. O. Jackson), [Biol. Surv.].

[12] i, p. 108.

Limnia combinata variety **sparsa** Loew (Pl. I, fig. 5.)

1862. *Tetanocera sparsa* Loew, Mon. Dipt. N. A., i, 117.

This is apparently but a variety of *combinata*. It is distinguished from that form by the less intensive wing design, with the interspaces hyaline, not yellowish. All the fuscous spots and bars are narrow, with broad quadrate clear spacings. The bars are seldom paired and are generally completely extending across the cells; the median streak in the cells is not very distinct.

The specimens before me are smaller than the general run of *combinata* (4 to 5 mm.).

Originally described from the "Middle States."

Specimens Examined.—4 ♂, 3 ♀.

Maine: Capens, July 21; Machias, July 15; (all C. W. Johnson), [all B. S. N. H.].

New Hampshire: Bretton Woods, June 24, (C. W. Johnson), [B. S. N. H.].

New York: Ithaca, August, [Cornell].

Limnia costalis Loew (Pl. I, fig. 16.)

1862. *Tetanocera costalis* Loew, Mon. Dipt. N. A., i, 118.

♂, ♀. A very distinct and easily recognized species. Similar to *combinata* but paler. Scutellum pale yellow, not darkened on disk, contrasting noticeably with the mesonotum; the latter not so very distinctly striped; praescutellur bristles absent. Second antennal joint broader than long, noticeably shorter than third. Marginal cell with rounded, fuscous spots, which are generally attenuated towards costa, or the costal margin may be broadly infuscated, thus reducing the size of the clear spots. The clear spaces of the wing assume a rounded form, not quadrate, and the median streak in the submarginal and especially the first posterior cell is, at most, almost obliterated, the fuscous spots becoming narrowly pointed bars along the costa veins. Posterior cross-vein straight and perpendicular. Abdomen at most with indistinct fuscous stripe.

Originally described from Illinois.

Specimens Examined.—2 ♂, 3 ♀.

New York: Ithaca, August 8, (J. M. Stedman), [Cornell].

Maryland: Plummer's Island, June to September, (W. L. McAtee), Biol. Surv.].

Limnia pubescens Day

1881. *Tetanocera pubescens* Day, Can. Ent., xiii, 86.

This form I have, for some time, considered a variety of *saratogensis*. It is, however, larger (8 mm.), with distinctly horizontal eyes; second antennal joint very large, broad and longer than the third, with five or six long bristles above near the apex.

In *unguicornis* subspecies *saratogensis* there are one or two, rarely three bristles. The general color is pale, and the wing design is also diluted. There seems to be no structural characters of differentiation, but from the constant number of antennal bristles, in the series examined, it seems advisable to consider this as a distinct species.

This was originally described from Washington Territory. I have a male from the same locality ("W. T."), which agrees with the original description, and I do not doubt this determination. I have also two pairs from Cayton, Shasta County, California, July 9–17, (E. P. VanDuzee), [Cal. Ac. Sci.].

Limnia shannoni new species (Pl. I, fig. 6; pl. III, fig. 36.)

Somewhat similar to *pubescens* Day, especially in size, general build and color, but the wing design offers a very distinct character of differentiation. In this respect it resembles *costalis*, but only noticeably so along the costa.

♀. General color tawny. Frons opaque, wax yellow, with anterior angles and the broad sunken median stripe polished and darker; a black spot at each of the two frontals and one opposite antennae. Face sparingly silvery, mottled with dark and light areas; epistoma light yellow. Cheeks yellow, silvery, with dark orbital spot. Occiput sparingly silvery except a broad post-orbital horizontal band. Second antennal joint polished laterally, with a distinct dark spot; arista densely white pubescent, with yellow base. Mesonotum with the usual yellow median stripe between two gray ones; lateral margins shining and grayish. Praescutellar bristles present. Scutellum pale on disk. Pleura below and metanotum gray. Abdomen with indistinct dark stripe. Legs pale yellow, slightly darker at tips of tarsi. Wings yellowish hyaline, with fuscous design as figured (fig. 6).

Head in profile as figured (fig. 36). Frons longer than broad, horizontal; ocellar bristles weak, much weaker than the strong post-verticals; the two frontals also weak. Presutural and prescutellar bristles present. Length.—6 to 7 mm.

Type.—♀; Plummer's Island, Maryland, October 16, 1913, (R. C. Shannon), [U. S. N. M.]. *Paratype*.—1 ♀; topotypical, October 28, 1915.

Limnia unguicornis Scopoli

1763. *Musca unguicornis* Scopoli, Ent. Carn., 335.
1820. *Tetanocera pratorum* Fallen, Dipt. Suec., Sciom., 6.
1830. *Limnia limbata* Desvoidy, Myod., 685.
1902. *Limnia unguicornis* Hendel, Abh. K. K. Zool.-Bot. Gesell., Wien., ii, 20.

On comparing European specimens of this species with our *saratogensis*, I cannot find any characters of specific importance differentiating the two. This observation also has been made by Loew.[13] However, there are some slight differences in the maculation of the wings, which may be individual, but which I prefer to consider at present as of subspecific value, and so retain Fitch's name for the American subspecies.

This species, sensu latiore, may be briefly characterized as follows: The costal cell almost completely and evenly infuscated; the fuscous spots of the other cells do not transverse the cell, but are interrupted by the longitudinal streak and are much narrower than the intermediate clearer spaces. The mesonotum has a broad median yellowish stripe between two broad gray ones, and laterad of these a distinct brown stripe along the lateral margins. Notopleural stripe gray. These stripes are most easily distinguished from behind.

I have not seen any specimens of the typical form in our fauna. It has the eyes horizontally oval; costal cell uniformly infuscated, without any suggestions of darker spots along the second vein, the infuscation however evanescing basally. Furthermore, the infuscation of the entire wing becomes evanescent at or about the small cross-vein.

Limnia unguicornis subspecies **saratogensis** Fitch (Pl. I, fig. 10; pl. III, fig. 33.)

1856. *Tetanocera saratogensis* Fitch, New York Report, i, 68.

In this form we have the following characters of differentiation:

♂, ♀. Eyes nearly round; second antennal joint as long as, or longer than third. The fuscous spots and costal infuscation extend basally as far as the auxiliary vein, whereas in the typical form these are evanescent at the small cross-vein. The darkening of the fore legs sometimes extends nearly to the base of the tibiae. Length.—4 to 6 mm.

Originally described from Saratoga, New York.

Specimens Examined (*saratogensis*).—54 ♂, 80 ♀.

CANADA: Carbonate, Columbia River, British Columbia, 2600 feet alt., July 7–12, (J. C. Bradley), [Cornell]. Farewell Creek, Moose Jaw, Saskatchewan, [Johnson]. Sandford, Ontario, June, (C. R. Crosby), [Cornell].

MAINE: Machias, July 17, (C. W. Johnson), [B. S. N. H.]. Orono, August, [Cornell].

[13] 1862. Mon. Dipt. N. A., i, 119.

Massachusetts: Auburndale, June 1; Cohasset, June to September; Gloucester, August 30; Wood's Hole, July 1, (all C. W. Johnson), [all B. S. N. H.].

Connecticut: Ridgefield, June 24, (I. N. Gabrielson), [Biol. Surv.].

New York: Dryden Lake, Tompkins County, June 16, (MacGillivray and Bradley), [Cornell]. Fishkill, July 4, (E. R. Kahnbach), [Biol. Surv.]. Freeville, April 17; Ithaca, May to September; Lake Mahopac, June 25, (T. D. O'Connor); McLean, July 2–3; Mud Creek, Tompkins County, June 17–20; Slatterville to Caroline, June 14, [all Cornell].

New Jersey: Atco, July 17, (C. W. Johnson); Westville, June, [all Johnson].

Pennsylvania: Hazleton, July 21, (W. G. Dietz); Lansdale, July 8, (Cresson); McConnellsburg, Fulton County, June 4; Swarthmore, June to September, (Cresson), [all A. N. S. P.].

Maryland: Branchville to Beltsville, June 4, (L. O. Jackson); Chesapeake Beach, June 18, (L. O. Jackson); Plummer's Island, May to June, (W. L. McAtee); Near Plummer's Island, May to August, (L. O. Jackson & W. L. McAtee); [all Biol. Surv.]. Glymont, May 25, [Johnson].

District of Columbia: Anacostia, July 22, (W. D. Appel), [Biol. Surv.].

Virginia: Boykins, June 10, (C. W. Johnson), [Johnson]. Four-Mile Run, May 23 and 31, (A. Wetmore and W. L. McAtee); Glencarlyn to mouth of Four-Mile Run, June 17, (W. L. McAtee); Mount Vernon, June 6, (W. L. McAtee); Staunton, May 25, (J. Silver); Tazewell, June 7, (L. O. Jackson); [all Biol. Surv.].

North Carolina: [no data].

Illinois: Chicago, [Cornell].

Missouri: Columbia, May 26 to June 8, (C. R. Crosby), [Cornell].

Minnesota: [no data].

Dakota: [no data].

California: Fallen Leap, Eldorado County, 6300 ft. alt., August 21; Lakeport, Lake County, August 16, (all W. M. Giffard), [Cal. Ac. Sci.].

Limnia unguicornis var. **severa** new variety

♂. This form may prove to be a good species, but from present knowledge it would not be advisable so to consider it here. It is rather easy to distinguish by the more intense pattern of the wing maculation, which is not evanescent basally. The maculation is very distinct and rather fully developed in the first basal, base of submarginal and base of discal cells. The apical half of fore tibiae and all of fore tarsi are black. Otherwise this is apparently similar to *saratogensis*. Length.—6 mm.

♀. Somewhat larger and the wing pattern more intense, very well marked towards base of wings.

Type.—♂; Cayton, Shasta County, California, July 16, 1918, E. P. VanDuzee). [Cal. Acad. Sci.] *Paratypes.*—5 ♂, 2 ♀; topotypical.

HEDRONEURA Hendel

1902. Hendel, Wien. Ent. Zeit., xxi, 265.

In general build, similar to *Euthycera*, but more slender. Scutellum flat; meso- and pteropleura setulose; arista white pubescent apically, basally black and thickened. No presutural nor presentellar bristles, but one or two dorso-centrals. Wings hyaline or tinged, with few spots at the junctures of cross-veins, and some clouding between the veins; no reticulations; posterior cross-vein angularly bent, so that its juncture with fourth vein is much beyond that with the fifth. The known species may be readily distinguished by this character.

The genus belongs to a group in which the wings are not reticulated, and the hind cross-vein is biangulate. There are probably other and better characters for the group, but the genera now included are not well understood, and for the present paper the above will serve well enough. In the group may be included the European species, *Musca* (*Elgiva*) *albiseta* Scopoli, *Tetanocera* (*Elgiva*) *lineata* Fallen, *Musca* (*Hedroneura*) *cucularia* Linné and *Musca* (*Hedroneura*) *rufa* Panzer. Of the genera represented *Hedroneura* is characterized by the absence of presutural and presentellar bristles.

The genus was proposed for the species related to *cucularia*, so we may consider *Musca cucularia* Linné (1758) the genotype.

Hedroneura lineata Day (Pl. I, fig. 2; pl. III, fig. 37.)

1881. *Tetanocera lineata* Day, Can. Ent., xiii, 88.
1914. *Hidroneura lineata* Malloch, Can. Ent., xlvi, 324.

Regarding the proposed synonymy of *Musca rufa*, I prefer to use Day's name until a thorough comparison with the European species is made. I have seen a specimen which was determined as *rufa*, but even then could not satisfy myself of the synonymy. Day's description does not leave any doubt as the species he had before him. It is easily recognized by the characters given below.

♂, ♀. Tawny to rufous; opaque, more or less yellowish gray species. Antennal orbital spot black; four mesonotal vittae and disk of scutellum, brown. Abdomen blackish medially; all femora with infuscated spot below near apices; tarsi black apically. Cross-veins, especially at junctures, also spot at end of second vein and streaks between second, third, fourth, and fifth veins, darker. Length.—6 mm.

Originally described from Connecticut. Malloch also reports it from Illinois and Wisconsin. I have two males and two females from Ithaca, New York, March 26 to June 20, [Cornell]. Also a female from Steamboat, Nevada, September 3, (H. G. Dyar), [U. S. N. M.], which is, apparently, conspecific, but the wings are not mottled with brown between the veins, and the spines of the hind femora are fewer in number.

DICTYOMYIA new genus

Body and wings simulating *Euthycera arcuata* while the head and antennae suggest affinities with *Sepedon*.

Robust species. Eyes vertically oval. Frons flat, convex in profile, slightly excavated before ocelli; ocellar bristles present, also two fronto-orbitals. Lunule prominent. Face broad, concaved in profile with a tubercle between antennae; lower median portion shining and apron-like. Cheeks broad. Antennae elongate, slender; first joint distinct; second, long; arista shortly and densely white plumose. Mesonotum with humeral, presutural, two dorso-centrals and prescutellar bristles present. Scutellum flat with four bristles. Meso- and ptero-pleura bare; sterno-pleura setulose. No pro-pleural bristle. Hind femora of male moderately spinose apically below; all tibiae with preapical bristles. Wings broad, short, fuscate, with numerous round white or clear spots; second, third and fourth veins, parallel.

Genotype.—*Tetanocera ambigua* Loew.

Dictyomyia ambigua Loew (Pl. I, fig. 19; pl. III, fig. 38.)

1864. *Tetanocera ambigua* Loew, Berlin Ent. Zeit., viii, 97.

This species has the superficial appearance of *Euthycera arcuata*, excepting in the form of the head, which is long, and with its long slender antennae suggesting species of *Sepedon*. However it is very distinct from either but apparently is allied to *Sepedon*.

♂, ♀. The frons has the two velvety black spots as in *Sepedon*, first antennal joint well exerted; second, three times as long as broad; third, three times as long as second. Lunule and facial tubercle tawny or brownish, latter conical. Mesonotum, scutellum, and abdomen, ochreous pruinose, with brown irrorations. Legs tawny with fore tibiae black apically, and all tarsi white basally. Wings broadly infuscated along costa, otherwise densely spotted with small round whitish spots. Length.—6 mm.

Originally described from Maine. I have seen a female from Fort Kent, Maine, August 19, (C. W. Johnson), [B. S. N. H.], and two males without locality datum. These are seemingly typical.

I have also a female labeled "Colo. 2221" (probably C. F. Baker), [Johnson], which may be a distinct species. It has the

following features: Frontal black spots broader, making the median shining stripe narrower. Lunule polished, black and more or less metallic tinged; facial tubercle black, very prominent, not conical, but ridge-like, surrounded at base by a silvery line, as are also the velvety facial spots. General color paler, especially of the face, legs excepting the tibiae and tarsi are yellow.

That this specimen represents a distinct species I will not venture to consider, as it is not in very good condition.

Tribe *Sepedontini*

The genera of this tribe have only two scutellar bristles. In other respects the face is long and apron-like; the second antennal joint generally long and slender; the arista white plumose or pubescent. Only one genus is represented within our fauna, but *Thecomyia* Perty of the Neotropical Region also belongs here, and probably *Cylindria* Desvoidy of Europe will fall within the tribe.

SEPEDON Latreille

1804. Latreille, Nouv. Dict. Hist. Nat., xxiv, tab. meth., 196.
1805. Latreille, Hist. Nat. Crust. Ins., xiv, 385.

This genus was first diagnosed in 1804, for the reception of *Syrphus sphegus* Fabricius (1781), which species must be the genotype. In our fauna the genus contains species of slender flies with practically immaculate wings; the frons is deeply excavated and ridged; the ocellar bristles are microscopic or absent; lunule prominent; face much produced below, rather snout-like, with the shining, lower median portion, apron-like. Scutellum has only the two approximated apical bristles; the hind tibiae without preapicals. The pleura and abdomen are without characteristic bristles, and those of the mesonotum are weak or rudimentary.

Key to the Species

1. Second antennal joint robust, distinctly broader than first 2
   This joint slender, not broader than first 3
2. Frons broadly excavated; frontal ridges well separated from each other and close to orbits ..... **fuscipennis**
   Frons narrowly excavated with ridges prominent and well separated from orbits. (Western) ..... **pacifica**

3. Frons broadly excavated with weak ridges; hind cross-vein strongly bowed outwards..... **tenuicornis**
Frons narrowly excavated with prominent ridges; hind cross-vein straight. 4
4. Hind femora of male deeply notched beneath; genital segment of female dorso-ventrally developed, with strong carina above..... **armipes**
Sexes not possessing such characters..... **pusillus**

Sepedon fuscipennis Loew

1859. *Sepedon fuscipennis* Loew, Wien. Ent. Monats., iii, 299.

♂, ♀. This species has the second antennal joint robust, broader than the first, as broad as the base of the tapering third. The dark frontal velvety spots are sometimes represented only by reddish stains. Length.—7–8 mm.

This and the following species form a group noticeable for their large size, oblique or arcuate hind cross-veins, and the broadly excavated frons with its weak ridges.

Specimens Examined.—7 ♂, 8 ♀.

Canada: Aweme, Manitoba, July 30, (E. Criddle), [A. N. S. P.].

Rhode Island: Riverton, July 31, [B. S. N. H.].

Massachusetts: Cohasset, September 1; Southbridge, August 27; Wellesley, September 23, [all B. S. N. H.].

New York: Ithaca, March 26 to June, [Cornell]; Lake George, July 24–25, (A. K. Fisher), [Biol. Surv.]; Wyandanch, Long Island, May 1, (W. T. Davis), [Davis].

Pennsylvania: Swarthmore, October 19, (E. T. Cresson), [A. N. S. P.].

Maryland: Chestertown, August 23, (E. G. Vanatta), [A. N. S. P.].

Sepedon pacifica Cresson

1914. *Sepedon pacifica* Cresson, Ent. News, xxv, 457.

This species may be readily distinguished by the characters given in the table. The third and fourth veins are noticeably convergent. It is a slightly larger species than the preceding one and occurs, as far as known, only west of the Rocky Mountains.

Specimens Examined.—8 ♂, 13 ♀.

California: Berkeley Hills, September 9, (J. C. Bradley), [Cornell]; Descanso, San Diego County, August 7, (J. C. Bradley), [Cornell]; Redwood Canyon, Marin County, May 17, (E. T. Cresson, Jr.), [A. N. S. P.].

Washington: (one spm. without other data).

Utah: Mouth of Bear River, July 17 to September 30, (A. Wetmore); Ogden, October 1, (A. Wetmore), [all Biol. Surv.].

Sepedon tenuicornis new species

♂, ♀. Similar to *fuscipennis*, but the second antennal joint is slender as in *armipes* and *pusillus*, narrower than the first joint, elongate, four to five times as long as its width at apex; small cross-vein less oblique, but more strongly bowed outwards. It differs from the other species with slender

antennae, in the broadly excavated frons with weak ridges, and ocellar tubercle nearer the line of the post orbits. Length.—6 mm.

Type.—♂; Little Falls, District of Columbia, August 22, 1915, (W. L. McAtee), [U. S. N. M.]. *Paratypes.*—1 ♂; Plummer's Island, Maryland, August 3, 1913, (W. L. McAtee). 1 ♀; same locality, June 7, 1914, (W. L. McAtee). 1 ♂; Maryland near Plummer's Island, July 4, 1914, (W. L. McAtee), [all Biol. Surv.]. 1 ♂, 3 ♀; Plummer's Island, Maryland, June 3, 1914, (R. S. Shannon). 1 ♀; Maryland near Plummer's Island, May 2, 1915, (R. C. Shannon), [all U. S. N. M.].

I also have before me two males and two females from the following localities: Boykins, Virginia, June 10, [Johnson]; Bladensburg, Maryland, May 10, (W. L. McAtee), [Biol. Surv.]; Chain Bridge, District of Columbia, July 19, (C. T. Greene), [U. S. N. M.].

Sepedon pusillus Loew

1859. *Sepedon pusillus* Loew, Wien. Ent. Monats., iii, 299.

In this and the following species the frons has a pair of median prominent ridges, originating each side of the ocellar tubercle and extending well towards the anterior frontal margin; the ocellar tubercle is situated well anterior to the line of the posterior orbits. The second antennal joint is long and slender. The hind cross-vein is fairly straight and vertical.

The present species has no peculiar femoral development. The female abdomen is narrow, with the fifth segment not noticeably developed dorso-ventrally, also the genital segments are not carinate although there is an acute angle above. Otherwise there seems to be no important differential characters.

Specimens Examined.—22 ♂, 12 ♀.

New York: Ithaca, July 20 to August 4; McLean, July 2–3; Mud Creek, Tompkins County, June 17–20; Slatterville to Caroline, June 14; Sea Cliff, Long Island, [all Cornell].

Maryland: Plum Point, June 21, (W. L. McAtee), [Biol. Surv.].

District of Columbia: Eastern Branch near Bennings, September 7, (W. L. McAtee), [Biol. Surv.].

Virginia: Bluemont, August 31; Great Falls, April 20 to October 4, (W. L. McAtee), [all Biol. Surv.].

Georgia: Summerville, August 22, (J. C. Bradley), [Cornell].

Nebraska: Fremont, July 28, [Cornell].

California: Cayton, Shasta County, July 12, (E. P. VanDuzee), [Cal. Acad. Sci.].

The series from California is of darker color than those from the eastern localities, but it shows no structural or even distinctive color characters to warrant recognition, except possible in a varietal sense.

Sepedon armipes Loew (Pl. III, fig. 39.)

1859. *Sepedon armipes* Loew, Wien. Ent. Monats., iii, 298.

This species is readily distinguished in the males by the peculiar formation of the hind femora, which are deeply notched beneath, as shown in figure 39. The females are not easy to separate from those of *pusillus*. However, one can do so by the character furnished in the shape of the genital segments of the abdomen. The abdomen is broad, with the fifth segment compressed laterally and developed dorso-ventrally, so that the two or three following segments are differentiated, being strongly carinate above. The third antennal joint of both sexes is sharply pointed. Length, 4 to 5 mm.

Specimens Examined.—10 ♂, 8 ♀.

Connecticut: Winnipank, August 4, [B. S. N. H.].

New York: Ithaca, June 23 to August 7; Freeville, August 17; McLean, July 2–3; [all Cornell]. Yaphank, September 1, (W. T. Davis), [Davis].

Maryland: Near Plummer's Island, July 27 to August 15, (W. L. McAtee), [Biol. Surv.].

Georgia: Silver Lake, Fulton County, August 10, [Cornell].

Illinois: Chicago, [Cornell].

Wyoming: Cheyenne, June to August, (F. T. Hartman), [Cornell].

California: Echo Lake, Siskiyou County, August 29, (J. A. Kusche), [A. N. S. P.]. San Diego County, October 15, (E. P. VanDuzee), [Cal. Acad. Sci.].

Systematic Arrangement

Subfam. Dryomyzinae Cresson
Neuroctena Rondani
anatis Fallen (*Dryomyza*)
Dryomyza pallida Day
simplex Loew (*Dryomyza*)
fumida Coquillett
Dryomyza Fallen
dayi Cresson

Subfam. Sciomyzinae
Tribe *Oidematopsini* Cresson
Oidematops Cresson
ferruginea Cresson

Tribe *Sciomyzini* Cresson
Sciomyza Fallen (*Bischofia* Hendel)
varia Coquillett (*Bischofia*)
aristalis Coquillett (*Dryomyza*)
Bischofia aristalis Coquillett
Dichrochira Hendel
apicata Loew (*Sciomyza*)
albicalcata Cresson
pleuralis Cresson
glabricula Fallen (*Sciomyza*)
Dichrochira glabricula Hendel
Atrichomelina Cresson
pubera Loew (*Sciomyza*)

Melina Desvoidy
Subg. *Melina*
fusca Cresson
vitalis Cresson
similis Cresson
albocostata Fallen (*Sciomyza*)
tenuipes Loew (*Sciomyza*)
Subg. *Graphomyzina* Macquart
albovaria Coquillett (*Sciomyza*)
nana Fallen (*Sciomyza*)
strigata Van der Wulp (*Sciomyza*)
? Sciomyza trabeculata Loew
guttata Coquillett (*Sciomyza*)
maculata Cresson
Subg. *Ditaenia* Hendel
grisescens Meigen (*Sciomyza*)
Sciomyza humilis Loew
Ditaenia grisescens Hendel
trivittata Cresson

Subfam. Euthycerinae Cresson
Tribe *Chaetomacerini*
Heteropteryx Hendel
johnsoni Cresson
Renocera Hendel
longipes Loew (*Sciomyza*)
johnsoni Cresson
amanda Cresson
Chaetomacera Cresson (*Tetanocera* auct.)
valida Loew (*Tetanocera*)
clara Loew (*Tetanocera*)
brevis Cresson
unicolor Loew (*Tetanocera*)
elata Fabricius (*Musca*)
Tetanocera elata Fallen
var. *rotundicornis* Loew (*Tetanocera*)
elata Fabricius
plebeia Loew (*Tetanocera*)
triangularis Loew (*Tetanocera*)
? syn. Tetanocera montana Day
vicina Macquart (*Tetanocera*)
Tetanocera plumosa Loew
Tetanocera struthio Walker
ferruginea Fallen (*Tetanocera*)
silvatica Meigen (*Tetanocera*)
Poecilomyia Melander (syn. *Poecilographa* Melander)
decora Loew (*Sapromyza*)
Trypetoptera Hendel
pallida Loew (*Tetanocera*)
Hoplodictya Cresson
setosa Coquillett (*Tetanocera*)
spinicornis Loew (*Tetanocera*)
Monochaetophora Hendel (*Dictya* Meig. auct.)
umbrarum Linne (*Musca*)
Tetanocera umbrarum Fallen
Tetanocera pictipes Loew

Tribe *Euthycerini* Cresson
Euthycera Latreille (*Lunigera* Hendel)
arcuata Loew (*Tetanocera*)
var. *uniformis* Cresson
borealis Cresson
Limnia Desvoidy
combinata Loew (*Tetanocera*)
var. *sparsa* Loew (*Tetanocera*)
costalis Loew (*Tetanocera*)
shannoni Cresson
pubescens Day (*Tetanocera*)
unguicornis Scopoli (*Musca*)
subsp. *saratogensis* Fitch (*Tetanocera*)
var. *severa* Cresson
Hedroneura Hendel
lineata Day (*Tetanocera*)
Dictyomyia Cresson
ambigua Loew (*Tetanocera*)

Tribe *Sepedontini* Cresson
Sepedon Latreille
fuscipennis Loew
pacifica Cresson
tenuicornis Cresson
pusillus Loew
armipes Loew

EXPLANATION OF PLATES

Plate I

(Wings)

All figures have a magnification of six diameters.

Fig. 1.—*Chaetomacera clara* Loew.
Fig. 2.—*Hedroneura lineata* Day.
Fig. 3.—*Chaetomacera clata* variety *plebeia* Loew.
Fig. 4.—*Melina alborvaria* Coquillett.
Fig. 5.—*Limnia combinata* variety *sparsa* Loew.
Fig. 6.—*Limnia shannoni* new species.
Fig. 7.—*Chaetomacera vicina* Macquart.
Fig. 8.—*Monochaetophora umbrarum* Linné.
Fig. 9.—*Limnia combinata* Loew.
Fig. 10.—*Limnia unguicornis* subsp. *saratogensis* Fitch.
Fig. 11.—*Poecilographa decora* Loew.
Fig. 12.—*Chaetomacera valida* Loew.
Fig. 13.—*Euthycera arcuata* Loew.
Fig. 14.—*Melina maculata* new species.
Fig. 15.—*Melina albocostata* Fallen.
Fig. 16.—*Limnia costalis* Loew.
Fig. 17.—*Trypetoptera pallida* Loew.
Fig. 18.—*Melina nana* Loew.
Fig. 19.—*Dictyomyia ambigua* Loew.

Plate II

(Profiles of heads)

All figures have a magnification of seventeen diameters.

Fig. 20.—*Neuroctena anilis* Fallen.
Fig. 21.—*Neuroctena simplex* Loew.
Fig. 22.—*Dryomyza dayi* new species.
Fig. 23.—*Dichrochira albicalceata* new species.
Fig. 24.—*Oidematops ferruginea* new species.
Fig. 25.—*Sciomyza aristalis* Coquillett.
Fig. 26.—*Melina nana* Loew.
Fig. 27.—*Renocera johnsoni* new species.
Fig. 28.—*Chaetomacera vicina* Macquart. Middle femur.
Fig. 29.—*Poecilographa decora* Loew.
Fig. 30.—*Chaetomacera valida* Loew.
Fig. 31.—*Chaetomacera clata* variety *plebeia* Loew.

Plate III

(Profiles of heads)

All figures have a magnification of seventeen diameters.

Fig. 32.—*Trypetoptera pallida* Loew.
Fig. 33.—*Limnia unguicornis* subsp. *saratogensis* Fitch.
Fig. 34.—*Euthycera arcuata* Loew.
Fig. 35.—*Hoplodictya setosa* Coquillett.
Fig. 36.—*Limnia shannoni* new species.
Fig. 37.—*Hedroneura lineata* Day.
Fig. 38.—*Dictyomyia ambigua* Loew.
Fig. 39.—*Sepedon armipes* Loew. Hind femur and tibia of male.
Fig. 40.—*Sepedon tenuicornis* new species.

A REVISION OF THE NORTH AMERICAN SPECIES OF THE GENUS MYRMECOPHILA

(ORTHOPTERA; GRYLLIDAE; MYRMECOPHILINAE)

BY MORGAN HEBARD

In recent years we have had frequent requests to determine North American material of the minute crickets which live in ants' nests, all of which belong to the cosmopolitan genus *Myrmecophila*. Much difficulty has been experienced in distinguishing the nominal species and a complete revision was clearly imperative, as soon as sufficient material could be assembled.

General collectors, and even Orthopterists, rarely encounter these strange little creatures, owing to their small size and concealed habitat, even in regions where they are known to be abundant. The Hymenopterists, particularly those specializing on ants, however, discover these insects much more frequently, and it is to two of these, Professor W. M. Wheeler, of the Bussey Institution, and Mr. W. M. Mann, of the Department of Agriculture, that we are deeply indebted for the loan of a large portion of the material forming the basis of the present study. In addition, Professor Wheeler has furnished invaluable aid in determining all of the numerous species of ants recorded in the present paper. All of the material in the Hebard Collection, the United States National Museum and the Academy of Natural Sciences of Philadelphia furnished practically the entire remainder. We grasp the present opportunity to thank most heartily Mr. W. T. Davis for submitting this portion of his collection, and both Mr. A. N. Caudell, of the National Museum, and Mr. James A. G. Rehn, of the Philadelphia Academy, for the privilege of studying this portion of the collections entrusted to their care.

MYRMECOPHILA Latreille

1829. *Myrmecophila* Latreille, Règne Anim., (ed. 2), v, p. 183.

At the time of original description the genus was considered monotypic.

Genotype.—Myrmecophila acervorum [*Blatta acervorum*] (Panzer).

The number and proportionate length of the spines and spurs of the caudal tibia, and spines and spinulae of the caudal meta-

tarsus, are of great specific diagnostic value. It is surprising to find that the otherwise careful and exhaustive work of Schimmer is faulty in this respect.[1] It is not surprising, considering the clearly superficial character of the work, that Scudder, in his paper on the species found in the United States, the two new species proposed in which are both found to be synonyms, has completely overlooked the most important of the features exhibited by this armament.

For the genus, the armament of the caudal tibia and metatarsus may be described as follows: Caudal tibia with dorsal margins supplied distad with one external and three or four internal spines; distal extremity armed with three pairs of spurs, the ventral pair being minute and of equal length, in some species so small that they are discernible only under relatively high magnification. Caudal metatarsus supplied dorsad with two or three (in some species individually varying to four) spinulae, distal extremity armed with one pair of spurs.

Specimens Examined, Methods and Conclusions

In the present paper three hundred and sixteen specimens have been studied, distributed as follows: one hundred and one in the Wheeler Collection, one hundred and three in the Hebard Collection, fifty-three in the United States National Museum, twenty-seven in the Mann Collection, seventeen in the Davis Collection, fourteen in the Academy of Natural Sciences of Philadelphia, and one in the Brooklyn Institute of Arts and Sciences.

The measurements have all been taken under the microscope at a magnification of twenty-three diameters; study of the material required a much higher magnification.

The color terms used are taken from Ridgway's "Color Standards and Nomenclature," as is our custom.

It is evident that of the six described North American species but four are valid. These are *pergandei*, *oregonensis*, *manni* and *nebrascensis*. All are very closely related and may eventually prove to be geographic races of one species. After carefully

[1] That author overlooks the pair of minute ventro-distal tibial spurs and treats the large dorsal pair as part of the series of spines of the dorsal margins. It is true that, in *acervorum*, the pair of ventro-distal tibial spurs are reduced to the minimum size encountered in the genus.

weighing all the evidence, however, we believe that they should be given full specific status. Typical *nebrascensis* might be supposed to represent the most distinct entity, but in Arizona the convergence of this species and *manni* is very decided.

Specific Diagnostic Characters

The species of *Myrmecophila* do not show the number of specific diagnostic characters usually found in the Orthoptera. We have found little or nothing of such value in the North American species, in size, form of segments, width of interocular space, size of eyes,[2] length in proportion to width, form of caudal femora, form of external male genitalia[3] or form of ovipositor.

In coloration certain factors appear to have decided value. The species *pergandei* and *oregonensis* are dark, very rarely, in specimens showing the maximum of recessive coloration, as pale as darker individuals of *manni* and *nebrascensis*. Moreover, *pergandei* normally differs from *formicarum* in having the paired generic pronotal spots faintly outlined in a paler shade of brown. The species *manni* and *nebrascensis* are pale, both developing a weakly barred color phase, this appearing frequently in *nebrascensis* in the eastern portion of its distribution, rarely in *manni* and only in the southeastern portion of its distribution.

In the spination of the caudal limbs, *nebrascensis* shows a decided difference from the other species, in having normally one less spine on the dorso-internal margin of the tibia and always one less spinula on the dorsal surface of the metatarsus.[4] The in the proportions of some of the spines of the caudal limbs, as other three species show slight, but apparently useful, differences

[2] The eye facets may show a different numerical range in the various species. We have not used this feature, as in the majority of specimens the eyes are partially hidden by the pronotum, while in many drying has affected these minute areas to such a degree that the number can not be accurately obtained.

[3] Insufficient alcoholic material is at hand to compare the concealed male genitalia of the species studied. These parts are, however, very simple for the one species examined and probably show no differential characters. In an alcoholic specimen of *nebrascensis* examined, the large opening to the seminal area below the anus was found to have its convex margins narrowly chitinous on each side.

[4] We find that *pergandei*, *oregonensis* and *manni* have normally three, rarely four, such spinulae; *nebrascensis* has two, lacking the median spinula.

noted in the present key to the species. The extremes of individual variation in each cause so close an approach to the normal for the others, however, that these features are not as distinctive as would be desired.

Variation in General Size and in Form of Caudal Femora

Individual size has proven an extremely interesting feature, due to the fact that in all the species studied, not only is there a direct influence generally exerted on the size of the individuals of a colony by the size of their host ants, but also that in colonies of very small ants, each species of these symbiotic crickets develops a depauperate type, found under no other conditions, so small that it would at first seem almost incredible so great a reduction in the size could exist. A specimen of *nebrascensis* representing this type, 1.47 mm. in length, is the smallest adult specimen of the Orthoptera known to us. In *oregonensis* alone is the size influenced by geographic factors.

The form of the caudal femora is found to vary in all of the species. These members are ovate when short, thus of this type in almost all of the smaller examples and normal in *nebrascensis*, the smallest of the species studied. When the caudal femora are longer, however, they assume a pyriform shape, this due to the flattening of the dorsal margin. As a result, the species which average larger, *pergandei*, *oregonensis* and *mannii*, show more frequently the pyriform type.

Life History

The extremely interesting life histories of a number of the species of *Myrmecophila* already have been carefully studied. As we have not had an opportunity for such observations, we refer to the following important papers bearing on the subject.

1819. Savi. Osservazioni sopra la Blatta acervorum di Panzer, Gryllus myrmecophilus nobis. Biblio. ital., xv, pp. 217 to 219.

1877. H. de Saussure. Mélanges Orth., ii, pp. 457 to 461, pl. 15 figs. xxvi, 1 to 5.

1900. W. M. Wheeler. The Habits of Myrmecophila nebrascensis Bruner. Psyche, ix, pp. 111 to 115, text figure.

1901. Wasmann. Zur Lebensweise der Ameisengryllen (Myrmecophila). Natur und Offenbarung, xlvii, pp. 1 to 24.

1903. F. Silvestri. Contribuzioni alla conoscenza dei Mirmecophili. I. Osservazioni su alcuni Mirmecofili dei dintorni de Portici. Ann. Mus. Zool. R. Univ. Napoli, (Nuova Ser.), i, no. 13, pp. 4 and 5.

1909. F. Schimmer. Beitrag zu einer Monographie der Gryllodeengattung Myrmecophila Latr. Zeitschr. für Wissensch. Zool., cxiii, pp. 409 to 534, pls. xxii to xxiv, 26 text figures.

We would observe that it has been ascertained, that different European species differ somewhat in their relations with their hosts. It would appear probable that the North American species all agree in being unwelcome inhabitants of the ants' nests, doing little or no harm to their hosts and wholly dependent upon them for the type of nourishment required.[5]

Each species is apparently symbiotic with a large number of species of ants. It has been shown, however, that certain species of ants are greatly preferred.

The following list shows the species of host ants with which the four North American species of *Myrmecophila* have been found to occur.

Myrmecophila pergandei Bruner

Crematogaster lineolata
Aphaenogaster treatae
Lasius umbratus
Formica fusca
Formica pallidefulva
Formica truncicola
Camponotus herculeanus
Camponotus castaneus

Myrmecophila oregonensis Bruner

Pheidole hyatti
Veromessor andrei
Pogonomyrmex californicus
Myrmica bradleyi
Tapinoma sessile
Prenolepis imparis
Prenolepis obscura
Formica cinerea
Formica camponoticeps
Formica rufibarbis
Formica fusca
Camponotus herculeanus
Camponotus maculatus

Myrmecophila manni Schimmer

Crematogaster lineolata
Myrmica mutica
Liomctopum apiculatum
Tapinoma sessile
Lasius niger
Formica rufibarbis
Formica fusca
Formica neogagates
Formica rufa
Camponotus maculatus
Camponotus acutirostris

[5] Observations made by various authors indicate that the food of these crickets is largely the secretions which lubricate the ants bodies and which are left on the walls of their passage ways, partly the food of the ants.

Myrmecophila nebrascensis Lugger

Pachycondyla harpax
Pheidole vas'ili
Pheidole desertorum
Crematogaster lineolata
Pogonomyrmex barbatus
Liomctopum apiculatum
Dorymyrmex pyramicus
Iridomyrmex pruinosus
Formica rufibarbis

Key for the North American Species of Myrmecophila

A. Dorso-internal margin of caudal tibia armed (normally, rarely in *manni* is one spine missing) with four spines, alternating in length. Dorsal surface of caudal metatarsus armed along the median line with three minute spinulae.

B. General coloration dark brown, in recessive examples yellowish brown. Abdominal segments never appearing banded. Dorso-external spine of caudal tibia as long as or longer than half the length of the tarsal joints.

C. Generic pronotal spots faintly outlined in a paler coloration. Caudal metatarsal spurs usually as long as terminal tarsal joint. Distribution: Atlantic Coast from Maryland southward, westward to Nebraska ..... **pergandei** Bruner

CC. Generic pronotal spots of general coloration. Caudal metatarsal spurs usually slightly longer than terminal tarsal joint. Distribution: Pacific Coast from Vancouver Island to the Mexican Border, eastward throughout the Cascades, Sierras and mountains of southern California, but not east of them ..... **oregonensis** Bruner

BB. General coloration pale yellowish brown. Abdominal segments sometimes margined caudad with a slightly darker shade, giving such individuals a banded appearance. Dorso-external spine of caudal tibia often distinctly less than half the length of the tarsal joints. (Generic pronotal spots of general coloration. Caudal metatarsal spurs usually slightly longer than terminal tarsal joint.) Distribution: Southeastern Washington to Mexican Border in Arizona and California, confined to arid or semi-arid country, not extending west of the eastern base of the Cascades, Sierras, and mountains of southern California, except in the San Diego region ..... **manni** Schimmer

AA. Dorso-internal margin of caudal tibia armed normally with three spines, increasing in length distad. Dorsal surface of caudal metatarsus armed along the median line with two minute spinulae. (General coloration yellowish brown. Generic pronotal spots of general coloration. Abdominal segments margined caudad with a slightly darker shade than the general coloration in frequent individuals, giving them a banded appearance.) Distribution: Eastern Nebraska southward to northern Texas and New Mexico and southwestward to the Mexican Border in eastern Arizona ..... **nebrascensis** Lugger

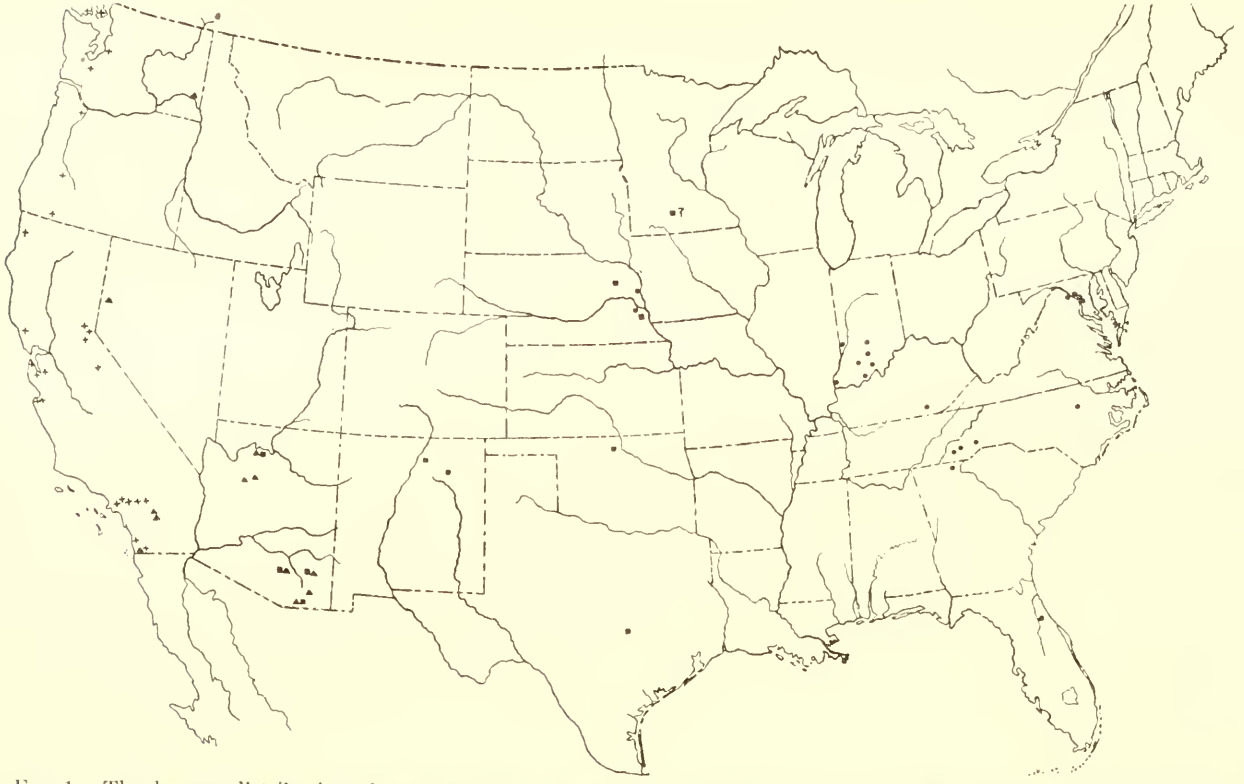


FIG. 1.—The known distribution of *Myrmecophila pergandei* is indicated by dots, that of *nebrascensis* by squares, that of *manni* by triangles and that of *oregonensis* by crosses. Due to the secretive habits of these insects, the definite limits of distribution in some directions will probably not be known for some time to come. As the Crescent City, Florida, record of *pergandei* is the only one for the genus in the Sabalian Zone of the southeastern United States, we do not at the present time feel full satisfaction as to its authenticity.

Myrmecophila pergandei Bruner

1881. *Myrmecophila pergandei* Bruner, Can. Ent., xvi, p. 42, figs. 4a and 4b. [♂, ♀; Atlantic States from Maryland southward.]

1912. *Myrmecophila pergandei* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 128. (Single type fixation.) [♀; Washington, District of Columbia. Host = *Camponotus herculeanus pennsylvanicus* DeGeer.]

The type is in the Hebard Collection, type number 202.

The present species develops the largest size of the species found in North America. Very close affinity to this insect is shown by *M. oregonensis* Bruner and *M. manni* Schimmer. It is indeed possible that these may eventually prove to be races of *pergandei*. Nearest agreement is shown by *oregonensis*, which occurs on the Pacific Coast, that insect distinguishable by its normally concolorous pronotal spots and slightly longer caudal metatarsal spurs.

Measurements (in millimeters)

♂	Length of body	Width of body[6]	Length of caudal femur	Width of caudal femur[7]	Length of caudal metatarsus
Washington, District of Columbia, *paratype*	2.18	1.29	1.36	.88 (×1.56+)	.68
Balsam, North Carolina	4.76	2.52	2.65	1.63 (×1.63—)	——
Hendersonville, North Carolina	2.92	1.56	1.43	1.02 (×1.42—)	.75
Corbin, Kentucky	3.6	2.11	2.31	1.43 (×1.61+)	1.34
South Bend, Nebraska	3.54	2.04	1.84	1.29 (×1.43—)	1.09
South Bend, Nebraska[8]	4.35	2.52	2.38	1.56 (×1.52+)	1.43
♀					Length of ovipositor
Washington, District of Columbia, *type*	4.15	2.58	——	—— ———	2.11
Washington, District of Columbia, *paratype*	3.87	2.52	2.31	1.52 (×1.52—)	2.04
Clayton, Georgia	2.52	1.56	1.36	.88 (×1.54+)	1.29
Posey County, Indiana	2.52	1.56	1.36	1.02 ———	1.29
Posey County, Indiana	3.4	2.24	2	1.26 (×1.6 —)	1.56
South Bend, Nebraska	3.54	2.24	2.04	1.36 (×1.5)	1.9
South Bend, Nebraska[9]	4.69	2.72	2.52	1.5 (×1.68)	2.24

[6] Taken across second dorsal abdominal segment. This is slightly greater than the pronotal width in males, much greater than that dimension in females.

[7] Number of times width of caudal femur is contained in its length.

[8] Largest and smallest males measured, of twenty from this locality.

[9] Largest and smallest females measured, of eleven from this locality.

In the material before us, the series of largest examples of this species were taken with the largest ants, *Camponotus herculeanus* Linnaeus; the smallest examples with small ants, *Crematogaster lineolata* Say. We believe that, in *pergandei*, geographic influences have little or nothing to do with the considerable size variation shown by this species. It does appear, however, that the size of the ants in a nest has a decided effect on the individuals of this cricket living in the same. The differences in size among adults from the same colony of *pergandei* is ascribable to individual variation.

In general coloration individuals of this species are as follows: Dorsal surface dark chestnut brown, shading to chestnut brown on all but margins of pronotum and proximal portions of proximal abdominal segments, well supplied with microscopic golden scales. Paired generic pronotal markings faintly outlined in a slightly paler shade, this rarely noticeable to the naked eye and sometimes subobsolete. Ventral surface, limbs and antennae buckthorn brown, except caudal tibiae and caudal femora dorsoproximad, which are slightly darker. Cerci ochraceous-tawny. In recessive examples of the present species the dorsal surface is russet, with paler areas tawny. The maximum recessive condition in the series is shown by the specimens from Raleigh, North Carolina, which are almost entirely pale ochraceous-tawny.

Specimens Examined.—73; 32 males, 23 females and 18 immature individuals.

Maryland: Gray's Farm, Linden, Montgomery County, (W. V. Warner), 1 large ♀, (host = *Formica truncicola obscuriventris* Mayr), [U. S. N. M.]. Plummer's Island, XI, 20, 1903, (A. N. Caudell), 1 small juv., (host = *Crematogaster lineolata* Say); X, 13, 1911, (J. D. Hood), 1 large ♀, (host = *Camponotus herculeanus ligniperda* var. *noveboracensis* Fitch), [both U. S. N. M.].

District of Columbia: Washington, IV, 22 to VI, 1885, (L. Bruner), 5 ♂, 4 ♀, 4 juv., *type*, *allotype* and 8 *paratypes*, (hosts = *Camponotus herculeanus pennsylvanicus* DeGeer, *Formica pallidefulva* Latreille and (one immature with) *Crematogaster lineolata* Say), [Hebard Cln.]; VI, 19, 1911, (Wm. T. Davis; under bark of log), 1 juv. ♂, 1 juv. ♀, (host = *Crematogaster lineolata* Say), [Davis Cln.]. Mulligan Hill, Washington, IV, 2, 1916, (H. S. Barber), 1 small ♂, (host = *Camponotus castaneus* Latreille), [U. S. N. M.].

Virginia: XI, 1883, 1 small juv., (host = *Crematogaster lineolata* Say), [Hebard Cln.]. Great Falls, VI, 11, 1910, (Wm. T. Davis), 2 large ♀, 1 juv. ♀, (host = *Formica pallidefulva* Latreille), [Davis Cln.]. Hot Springs,

VIII, 3, 1916, (M. Hebard; under bark of pine log), 1 large juv. ♀, (host = *Formica fusca* var. *subsericea*), [Hebard Cln.].

North Carolina: Raleigh, I, 22, 1906, (C. S. Brimley), 1 small and very pale ♂, (host = *Lasius umbratus mixtus* var. *aphidicola* Walsh), [U. S. N. M.]; X, 1 very pale ♂, [Davis Cln.]. Retreat, VIII, 6, (H. G. Hubbard), 1 small ♂, (host = *Aphaenogaster treatae* Forel), [U. S. N. M.]. Hendersonville, VI, 1907, (F. Sherman), 1 small ♂, [U. S. N. M.]. Balsam, 4500 to 5700 feet, VII, 24, 1903, (A. P. Morse), 1 large ♂, (host = *Camponotus herculeanus pennsylvanicus* DeGeer), [Hebard Cln.].

Georgia: Clayton, 2000 to 3700 feet, VI, 1909, (W. T. Davis), 1 small ♀, 4 juv., (host = *Crematogaster lineolata* var. near *pilosa* Pergande), [Wheeler and Davis Clns.].

Kentucky: Corbin, VIII, 24, 1904, (H. S. Barber), 1 large ♂, (host = *Camponotus herculeanus pennsylvanicus* var. *ferrugineus* Fabricius), [U. S. N. M.].

Florida: Crescent City, I juv. ♂, [Hebard Cln.].

Indiana: Crawford County, IX, 6, 1902, (W. S. Blatchley), 1 large ♀, [Hebard Cln.]. New Harmony, IV, 27, 1901 to V, 6, 1902, (W. S. Blatchley), 1 large ♀, 1 small ♀, 1 juv. ♀, [Hebard Cln.].

Nebraska: South Bend, 1050 feet, (in rotten log, low ground on island), 20 ♂, 11 ♀, 2 juv. ♂, 5 juv. ♀, (host = *Camponotus herculeanus ligniperda* var. *noveboracensis* Fitch), [Hebard Cln.].

In addition to the localities listed above, the species has been recorded by Blatchley from Orange, Dubois, Perry and Knox Counties and Mitchell, Lawrence County, Indiana, and by Bruner, with a query, but probably correctly, from Omaha, Nebraska.[10]

Myrmecophila oregonensis Bruner

1884. *Myrmecophila oregonensis* Bruner, Can. Ent., xvi, p. 43. [♀, juv.; Portland, Oregon.]

1899. *Myrmecophila formicarum* Scudder, Psyche, viii, p. 426. [♂, ♀; Sisson, El Dorado County, Placer County and Coronado, California.]

The adult female described has been selected as single type of *oregonensis*.[11] We here select the unique male, taken by A. P. Morse, at Sisson, California, on September 3, 1897, and now in the Museum of Comparative Zoölogy, as single type of *M. formicarum* Scudder.

[10] Smith, in his "Insects of New Jersey," 1900, states that this species "occurs in ant nests from Massachusetts to Maryland; but not yet actually taken, because not sought for, in New Jersey." This is not the case, as the northernmost locality at which the species has been found on the Atlantic Coast is in Maryland near the District of Columbia. It is possible that the species may eventually be found in extreme southern New Jersey, but it is practically certain that it does not occur over by far the greater portion of that state.

[11] Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 128, (1912).

Study of the types and the material now at hand shows conclusively that *formicarum* is a synonym of *oregonensis*, as indicated above.

Very close affinity to *M. pergandei* Bruner is shown by the present species. Under the former species a comparison is made on page 98. Considering the variation shown and the weakness of the degree of differentiation which has taken place, we would not be surprised should further investigation, particularly breeding experiments, show *oregonensis* to be synonymic with *pergandei*, or at best a geographic race. To *oregonensis* close relationship is shown by *M. manni* Schimmer, under which species the two are compared on page 105.

For the present, however, we believe it best to recognize the four species, *pergandei* of the eastern United States, *manni* of the western arid and semi-arid regions of the western United States, *oregonensis* of the Pacific Coast and *nebrascensis* of the central western and southwestern United States.

Bruner, when he described *oregonensis*, had but one adult example. His original description is correct as to the diagnostic differences in color, when compared with *pergandei*, but incorrect in stating that *oregonensis* is more slender. Scudder correctly gives the uniform character of coloration for his synonymic *formicarum* and for *oregonensis*. That author is, however, in error in giving as differential characters the stouter form and flatter body of "*formicarum*," when compared with *pergandei*, and its lighter coloration, when compared with *oregonensis*, as well as the difference in caudal tibial spurs between "*formicarum*" and *oregonensis*. These features are all valueless, as is clearly shown by the present series, being wholly attributable to individual variation.

The following table of measurements shows *oregonensis* to be of an average smaller size than *pergandei*, and to be subject to an even greater degree of size variation than that species.

Measurements (in millimeters)

♂	Length of body	Width of body	Length of caudal femur	Width of caudal femur[12]	Length of caudal metatarsus
Victoria, British Columbia....	3.2	1.9	1.97	1.29 (×1.53—)	1.15
San Juan Island, Washington..	3.33	2.11	1.9	1.22 (×1.56—)	1.15

♂	Length of body	Width of body	Length of caudal femur	Width of caudal femur[12]	Length of caudal metatarsus
Lake Tahoe, California	3.13	2.11	2.11	1.16 (×1.82—)	2.12
Palo Alto, California	2	1.3	1.22	.85 (×1.44+)	.75
Pasadena, California	3.13	2.04	—	—	—
San Ysidro, California	2.88	1.97	1.77	1.19 (×1.5 —)	—
♀					Length of ovipositor
Victoria, British Columbia	3.26	2.27	1.9	1.22 (×1.56—)	1.56
Seattle, Washington	3.54	2.04	1.84	1.16 (×1.59—)	1.5
Divide, Oregon	2.86	2	1.77	1.22 (×1.45)	1.43
Lake Tahoe, California	3.26	2	1.77	1.16 (×1.53—)	1.46
Placer County, California	3.67	2.72	2.54	1.5 (×1.69—)	1.97
El Dorado County, California	2.79	1.74	1.63	1.04 (×1.58+)	1.36
San Francisco, California	2.52	1.63	1.54	1.02 (×1.51—)	1.29
Alameda County, California	1.5	1.02	1.02	.64 (×1.59+)	.82
Palo Alto, California	2	1.43	1.22	.81 (×1.51—)	1.09
Los Angeles County, California	3.06	2.15	2.11	1.23 (×1.71+)	1.41
Los Angeles County, California	1.9	1.29	1.15	.73 (×1.58+)	.95
Sierra Madre, California	2.86	1.5	1.32	.9 (×1.47—)	1.04
San Ysidro, California	2.79	1.56	1.52	1.02 (×1.49+)	1.29
San Ysidro, California	1.6	1.02	.88	.6 (×1.47+)	.72

In the series of females measured, the length of the caudal metatarsus ranges from .4 in the smallest example to 1.29 mm. in the largest specimen.

The extreme variation in size of *oregonensis* is most interesting. Geographic distribution here is clearly a size factor. The material from British Columbia southward to northern California, and as far as King's River in the Sierras, averages large; that from the region about San Francisco, south to the Mexican border, averages small. The size of the host ants is, however, in some cases a much more powerful factor in the size development of these symbiotic crickets. An extremely depauperate condition is seen to occur in nests of the small ant *Tapinoma sessile* Say. Specimens taken in nests of that ant, in Alameda County and at San Ysidro, are very much smaller than any other adults before us. That this is not a fixed rule for all material occurring with that species of ant is shown by a medium sized adult cricket, taken

[12] The number of times the width of the caudal femur is contained in its length is also given.

under the same conditions at San Ysidro, but on a different date. In the six other cases before us of material from nests of small sized ants, however, the crickets are either small immatures, small or very small adults.

That immature and adult crickets inhabit the same ants' nest is shown by a number of cases in the present series.

The normal general coloration for *oregonensis* is as follows: Pronotum and proximal abdominal segments cinnamon brown, rapidly becoming darker caudad, so that the major portion of the dorsal surface of the abdomen is mummy brown. Head mummy brown. Palpi, underparts and limbs paler, buckthorn brown with an ochraceous-tawny tinge. Antennae of the limb coloration proximad, darkening to cinnamon brown. Cerci of the limb coloration, often more strongly tinged with ochraceous-tawny. As in *pergandei*, the dorsal surface and appendages are rather thickly supplied with minutely microscopic golden scales. These are easily rubbed off and have completely disappeared in some of the alcoholic material at hand.

Individuals of recessive coloration have the dorsal surface ochraceous-tawny, becoming darker only distad on the abdomen. The immature individual from Humboldt County, California, is exceptionally pale, as pale as is normal for *manni*.

Specimens Examined.—93; 21 males, 51 females and 21 immature individuals.

British Columbia: (G. W. Taylor), 1 ♂, 1 ♀, [Hebard Cln.]. Wellington, Vancouver Island, III, 18 to IX, 24, 1900 to 1904, (G. W. Taylor), 1 small ♂, 2 small ♀, 1 large ♀, 1 juv.; VIII, 8, 1906, (A. N. Caudell), 1 juv., [all U. S. N. M.]. Nanaimo, Vancouver Island, VIII, 7, 1906, (A. N. Caudell), 2 small juv., [U. S. N. M.].

Washington: San Juan Island, VII, 1 to 7, 1909, (W. M. Mann), 1 large ♂, (host = *Camponotus herculeanus modoc* Wheeler), [Hebard Cln.], 2 large juv., (host = *Formica fusca* var. *neorufibarbis* Emery), [Mann Cln.]. Seattle, (T. Kincaid), 1 large ♂, 3 large ♀, 1 large juv., [U. S. N. M. and Hebard Cln.]. Tenino, (H. G. Hubbard), 1 medium ♂, (host = *Formica fusca* var. *argentea* Wheeler), [U. S. N. M.].

Oregon: Divide, IX, 12, 1897, (A. P. Morse), 2 large ♀, [U. S. N. M. and Hebard Cln.].

California: Bair's Ranch, Redwood Creek, Humboldt County, VI, 12, (H. S. Barber), 1 small pale juv., [U. S. N. M.]. Placer County, IX, 1 large ♀, *paratype* of *M. formicarum* Sc., [Hebard Cln.]. El Dorado County, II, 2 medium ♀, 1 *paratype* of *M. formicarum* Sc., [both Hebard Cln.]. Lake Tahoe, VII, 1915, (for W. M. Wheeler), 1 medium large ♂, 1 medium large ♀,

1 juv., (host = *Myrmica bradleyi* Wheeler), 1 large ♀, 1 medium large ♀, 1 juv., (host = *Formica fusca* var. *neorufibárbis* Emery), 1 juv., (host = *Camponotus maculatus vicinus* Mayr), [all Wheeler Cln.]. King's River, (H. Heath), 2 large ♀, [Wheeler Cln.]. Sonoma County, VIII, 1 small juv., [Brooklyn Institute of Arts and Sciences]. Land's End, San Francisco, X, 17, 1909, (F. X. Williams), 1 medium small ♀, 1 juv., [U. S. N. M.]. Alameda County, III, 2 very small ♀, 2 very small juv.?, (host = *Tapinoma sessile* Say), [U. S. N. M.]. Palo Alto, I, 1911, (W. M. Wheeler), 1 small ♀, (host = *Camponotus maculatus mccooki* Forel), [Wheeler Cln.]; (Isabel McCracken), 1 small ♂, 4 small ♀, 2 juv., (host = *Veromessor andrei* Mayr), [Wheeler Cln.]; XI, 11, 1913, 2 small ♂, 4 small ♀, [Mann Cln.]. Stanford University, Palo Alto, I, 23 to III, 9, 1910 and 1915, 3 small ♂, 9 small ♀, 1 juv., (hosts = *Formica rufibarbis* var. *occidua* Wheeler; *Prenolepis imparis* Say; *Formica camponoticeps* Wheeler; *Prenolepis* near *obscura* Mayr; *Veromessor andrei* Mayr), [Mann, Hebard and Wheeler Cln.]; II, 1, 1900, 1 small ♀, (host = *Camponotus maculatus maccooki* Forel, [Davis Cln.]. Pacific Grove, II, 20, 1910, (W. M. Mann), 1 large ♀, (host = *Camponotus maculatus vicinus* var. *maritimus* Wheeler [Mann Cln.]. Los Angeles County, (D. W. Coquillett), 2 medium ♂, 1 small ♂, 1 very small ♂, 1 medium ♀, 1 very small ♀, [U. S. N. M. and Hebard Cln.]. Pasadena, IV, 6, 1916, 1 small ♂, 1 medium small ♀, (hosts = *Pogonomyrmex californicus* Buckley, *Formica cinerea pilicornis* Emery), [Davis Cln.]; XII, 7, 1910, (W. M. Wheeler), 1 large ♂, (host = *Formica cinerea pilicornis* Emery), 1 very small juv., (host = *Pheidole hyatti* Emery), [both Wheeler Cln.]. Sierra Madre, XII, 2, 1910, (W. M. Wheeler), 1 medium small ♀, (host = *Formica rufibarbis* var. *occidua* Wheeler), [Wheeler Cln.]. San Gabriel Mountains, near Claremont, XII, 9, 1910, (W. M. Wheeler), 1 very small juv., (host = *Tapinoma sessile* Say), [Wheeler Cln.]. Santa Ana Canyon, San Bernardino Mountains, (H. Wickham), 1 juv. ♀, [U. S. N. M.]. La Jolla, XII, 20, 1910, (W. M. Wheeler), 1 small ♀, (host = *Veromessor andrei* Mayr var. [Wheeler Cln.]. San Ysidro, XII, 24, 1910 to I, 10, 1911, (W. M. Wheeler), 3 small ♂, 4 small ♀, (host = *Formica rufibarbis* var. *occidua* Wheeler), 1 medium ♀, 1 very small ♀, (host = *Tapinoma sessile*), [all Wheeler Cln.].

In addition to the localities given above, this species has been recorded by Scudder from Victoria, Vancouver Island, British Columbia, Portland and Siskiyou, Oregon, and as the synonymous *formicarum* from Coronado, California.

Myrmecophila manni Schimmer

1911. *Myrmecophila manni* Schimmer, Deutsch. Ent. Zeitschr., 1911, p. 443, text fig. 1. [♂, ♀; Wawawai, Washington.]

The cotypes of this species are apparently in the collection of F. Schimmer, at Meerane, Saxony.

The present insect is an inhabitant of the semi-arid and arid regions of the western United States, ranging from southern Washington to the Mexican border. The species' western limit

of distribution is the foot of the mountain boundaries formed by the Cascade, Sierra, Tehachapi, San Gabriel, San Bernardino and San Jacinto Mountains, but near the Mexican border, in the vicinity of San Diego, it invades the coastal region through the Cuyamacas and other lower mountains. In that semi-arid region only, the ranges of *M. oregonensis* Bruner and *manni* overlap.

It is noteworthy that, though *manni* is probably widely distributed through the plateaus and mountains of Arizona and adjacent regions, it apparently does not occur anywhere in the mountains forming the western boundary of its distribution, those mountains being the habitat of *oregonensis*, as are the coastal regions westward of them.

We find that *manni* is distinctive, when compared with *oregonensis*, in being very pale in general coloration.[13] Schimmer was incorrect in supposing *manni* to be a very distinct species, recognizable particularly by the lack of minute scales. The alcoholic material which he had before him had been shorn of scales, due probably to washing about in the preservative. A large number of the present series, similarly preserved, are before us and exhibit the same condition, the series, however, showing plainly the reason. The caudal tibial spines are usually proportionately somewhat shorter than in *oregonensis*. This weak feature and the pale coloration are the only specific diagnostic characters we can find to separate *manni* from that species.

Though fully aware of the weakness of general coloration as a specific diagnostic character, the large series of these two species before us are each so generally constant *oregonensis* dark, *manni* pale, that we believe it best to recognize *manni* as a valid species, rather than consider it a geographic race of *oregonensis* or an absolute synonym of that species.

We would note that in Arizona the distribution of *manni* coincides with the westernmost known distribution of *M. nebrascensis* Lugger.

[13] The light coloration is evidently not governed by the usually pale surroundings of the desert or semi-arid environment of the species. This is shown by the character of the environment in which we found *manni* and the pale condition of *nebrascensis* at Grand Canyon Station and Ash Fork, Arizona. See remarks under material recorded.

The convergence shown by *manni* and *nebrascensis* in Arizona causes material from that region to be separated with considerable difficulty. We find that occasional individuals of the present species from Arizona, particularly among the smaller examples, have the third spine of the dorso-internal margins of the caudal tibiae greatly reduced, rarely missing on one or both limbs. As Arizonan specimens of *nebrascensis* are almost always very pale and uniform in coloration, not showing the barred type which is more usual in material of that species from Nebraska and Texas, the only difference which can be determined, in such specimens as described above, is that of the caudal metatarsal armament, showing dorsad three spines in *manni*, two in *nebrascensis*.

The present species shows decided size variation, but by no means as great as is shown by the larger series of *oregonensis* before us.

Measurements (in millimeters)

♂	Length of body	Width of body	Length of caudal femur	Width of caudal femur[14]	Length of caudal metatarsus
Wawawai, Washington, *topotype*	2.4	1.5	1.41	.88 (×1.64—)	.748
Wawawai, Washington, *topotype*	2.5	1.7	1.57	.95 (×1.64—)	.884
Pyramid Lake, Nevada	2.38	1.3	——	—— ———	——
San Ysidro, California	2.86	1.84	1.72	1.16 (×1.48+)	——
Oracle, Arizona	2.58	1.97	1.7	1.09 (×1.56—)	1.02
Santa Rita Mts., Arizona	2.86	1.84	——	—— ———	1.02
Huachuca Mts., Arizona	3.06	1.77	1.5	.95 (×1.58—)	.85
♀					Length of ovipositor
Wawawai, Washington, *topotype*	2.58	1.56	1.36	.88 (×1.55—)	1.09
Pyramid Lake, Nevada	2.52	1.5	——	—— ———	1.36
Palm Springs, California	1.97	1.25	1.09	.76 (×1.43+)	1
San Ysidro, California	2.52	1.77	1.52	.99 (×1.54—)	1.22
Williams, Arizona	2.58	1.43	——	.88 ———	1.04
Oracle, Arizona	2.72	1.84	1.6	1 (×1.6)	.88
Santa Rita Mts., Arizona	3.33	2.31	1.8	1.09 (×1.65+)	1.5
Huachuca Mts., Arizona	2.86	1.97	1.73	1.16 (×1.49+)	1.3

It would appear that geographic factors have little or no influence on the size in *manni*, the variation shown being attributable to individual variation and some correlation with the size of the ants forming the host colony.

[14] Number of times width of caudal femur is contained in its length.

The normal general coloration in the present species is entirely cinnamon buff, except the eyes which are blackish brown and the distal portion of the ovipositor which, as in the other species, is shining, dark reddish brown. In extremes of recession individuals are slightly paler, ochraceous-buff. Some material is ochraceous-tawny, while in a few specimens from southern Arizona the dorsal segments, except the pronotum, are broadly margined caudad with a very slightly darker shade, thus showing close resemblance in general appearance to the banded type developed in *M. nebrascensis* Lugger.

A number of specimens among those in a poor state of preservation are as dark as pale material of *oregonensis*. It is clear that, in so delicate and pale a species as the present, discoloration readily occurs and is in our opinion responsible for this. As color is important in distinguishing *oregonensis* and *manni*, the possibility of discoloration in material of the latter species should always be remembered.

Specimens Examined.—68; 16 males, 36 females and 16 immature individuals.

Washington: Wawawai, Whitman County, III, 20 to IV, 24, 1909, (W. M. Mann), 3 ♂, 5 ♀, (hosts = *Formica rufa obscuripes* Forel, *Formica neogagates* Emery, *Formica rufibarbis* var. *occidentalis* Wheeler, *Formica fusca* var. *argentea* Wheeler, *Formica fusca* var. *marcida* Wheeler), [A. N. S. P., U. S. N. M., Hebard and Wheeler Cln.].

Nevada: Pyramid Lake, 2 ♂, 1 ♀, 2 juv. ♀, (hosts = *Myrmica mutica* Emery and *Formica neogagates* var. *vetula* Wheeler), [Mann Cln.].

California: Chino Canyon, five miles northwest of Palm Springs, IV, 5, 1917, 4 small ♀, (host = *Tapinoma sessile* Say), [Davis Cln.]. Palm Springs, II, 15, (H. G. Hubbard), 1 small ♀, 2 small juv., [U. S. N. M.]. San Ysidro, Cal., I, 6 and 7, 1911, (W. M. Wheeler), 1 ♂, 3 ♀, (hosts = *Camponotus maculatus vicinus* var. *luteangulus* Wheeler, *Camponotus maculatus nitidiventris* Emery), [Wheeler Cln.].

Arizona: Grand Canyon Station, Coconino Plateau, 6800 feet, X, 6, 1919, (M. Hebard; under dark lava boulder in passages of ants' nest in dark soil), 1 ♂, [Hebard Cln.]. Williams, Coconino Plateau, 6900 feet, I, 28, 1911, (W. M. Wheeler), 1 juv., (host = *Formica fusca* var. *argentea* Wheeler), [Wheeler Cln.]; V, 26 to VI, 3, (H. S. Barber), 1 ♂, 2 ♀, 4 juv., (hosts = *Formica fusca* Linnaeus and *Lasius niger* var. *sitkaensis* Pergande), [U. S. N. M.]. Ash Fork, VIII, 1, 1919, 5300 feet, (Rehn and Hebard; in ants nest, *Crematogaster lineolata* Say var., under volcanic fragment at summit of hill[15]), 2 ♀, [A. N. S. P. and Hebard Cln.]. Oracle, I, 8, 1914, (E. A.

[15] In the field notes for the specimens taken at Ash Fork we note, "Their paleness made them very conspicuous on the dark stone among the still darker ants." This was true also for the material taken at Grand Canyon Station.

Schwarz), 1 ♂, (host = *Camponotus acutirostris* Wheeler), [U. S. N. M.]; 4500 feet, III, 13 and 14, 1919, (W. M. Wheeler), 7 ♀, (host = *Camponotus acutirostris* Wheeler), [Wheeler Cln.]; 5000 feet, III, 11, 1919, (W. M. Wheeler), 1 ♀, 6 juv., (host = *Liometopum apiculatum* Mayr), [Wheeler Cln.]; 4500 feet, III, 16, 1919, (W. M. Wheeler), 1 juv., (host = *Crematogaster lineolata* Say var.), [Wheeler Cln.]. Post Canon, Pinaleño Mountains, VII, 18, 1917, (W. M. Wheeler), 2 ♀, (host = *Formica rufibarbis* var. *gnava* Buckley), [Wheeler Cln.]. Santa Rita Mountains, VI, 17, (Hubbard and Schwarz), 1 ♂, 1 ♀, (host = *Camponotus* sp.), [U. S. N. M.]. Huachuca Mountains, XI, 10 to 13, 1910, (W. M. Wheeler), 2 ♂, 2 ♀, (host = *Camponotus maculatus bulimosus* Wheeler), [Wheeler Cln.]. Ramsey Canon, Huachuca Mountains, (W. H. Mann), 4 ♂, 5 ♀, (host = *Liometopum apiculatum* Mayr.), [Mann Cln.].

This species was previously known only from the type locality, Wawawai, Washington.

Myrmecophila nebrascensis Lugger

1898. *Myrmecophila nebrascensis* Lugger, Orth. of Minnesota, p. 260, fig. 169. [No locality given, figured type from Bruner's series taken at West Point, Nebraska.]

1899. *Myrmecophila nehawkae* Scudder, Psyche, viii, p. 428. [♂, ♀; Weeping Water, Nebraska.[16]]

The type of this species is the female from West Point, Nebraska, taken by Bruner on May 6, 1891, which was loaned to Lugger by Bruner and figured by the former author as *Myrmecophila nebrascensis* Bruner. Lugger was at that time in ignorance of the fact that the species had not been described. This specimen was located in the collections of the Division of Economic Zoology of the University of Minnesota. As this specimen belongs to the Bruner Collection, it has been most kindly returned by the University of Minnesota. The Bruner North American Collection having been incorporated in the Hebard Collection, this type now bears the type number 529 of the latter collection.

The collections now before us prove conclusively the synonymy indicated above. The name *nehawkae* was based on material of *nebrascensis* of very small size, taken from nests of the small ant *Crematogaster lineolata* Say. Other material of *nebrascensis* now at hand, from nests of small sized ants, is even smaller than the

[16] We here select as single type of *M. nehawkae* Scudder, a female, taken at Weeping Water, Nebraska, in nest of *Tapinoma sessile* Say. Hebard Collection, Type no. 396.

material on which Scudder based *nchawkae*. Thus we find great depauperation governed by the small size of the host ant in all of the North American species of *Myrmecophila*.

The different armament of the caudal tibiae and metatarsi readily distinguishes *nebrascensis* from the other forms found in the United States, excepting as to the tibiae of occasional Arizonan individuals of *manni*, as discussed under that species. In coloration close agreement with *M. manni* Schimmer is found, though a banded condition is apparently more frequently encountered in the present species. For this reason material from Arizona must be carefully examined in regard to the spine formulae, particularly of the caudal metatarsi, as in that geographic area the distributions of *manni* and *nebrascensis* overlap.

An extremely interesting account of the habits of this species has been given by Dr. W. M. Wheeler.[17]

Measurements (in millimeters)

♂	Length of body	Width of body	Length of caudal femur	Width of caudal femur	Length of caudal metatarsus
West Point, Nebraska, *topotype*[18]	2.04	1.5	1.53	1.08 (×1.41+)[19]	.75
West Point, Nebraska, *topotype*	1.97	1.4	1.4	1.06 (×1.32+)	.75
Weeping Water, Nebraska[20]	1.77	.75	1.04	.71 (×1.47—)	—
Austin, Texas	2.38	1.43	1.5	.95 (×1.58—)	.74
Las Vegas, New Mexico	2.18	1.47	1.43	.97 (×1.47+)	.74
Oracle, Arizona	2.04	1.16	1.22	.73 (×1.67+)	—
Oracle, Arizona	1.74	1.02	.95	.62 (×1.53+)	.476
Huachuca Mountains, Arizona	1.3	.88	—	— ———	—
Huachuca Mountains, Arizona	1.5	.95	—	— ———	—
♀					Length of ovipositor
West Point, Nebraska, *topotype*	2.31	1.43	1.38	.95 (×1.45+)	.95
West Point, Nebraska, *topotype*	2.86	1.63	1.53	1.09 (×1.40+)	1.22
Weeping Water, Nebraska[21]	2.04	1.09	.97	.66 (×1.47—)	.76
Weeping Water, Nebraska[20]	1.5	.95	—	— ———	.71
Ponca City, Oklahoma	1.97	1.16	—	— ———	.71

[17] Psyche, ix, pp. 111 to 115, text fig., (1900).

[18] See original reference.

[19] Number of times width of caudal femur is contained in its length.

[20] Paratype of the synonymous *M. nchawkae* Scudder.

[21] Type of the synonymous *M. nchawkae* Scudder.

	Length of body	Width of body	Length of caudal femur	Width of caudal femur	Length of ovipositor
Austin, Texas	2.58	1.63	1.56	1.02 (×1.53—)	1.02
Las Vegas, New Mexico	1.63	1.06	.88	.61 (×1.44+)	.72
Las Vegas, New Mexico	2.11	1.63	1.43	.97 (×1.47+)	1.16
Oracle, Arizona	2.45	1.54	—	—	.85
Oracle, Arizona	1.7	1.02	—	—	.65

It appears that geographic factors have little to do with size variation in this species. In the present series there is a larger percentage of depauperate material, from nests of small sized ants, than in any other of the other species here treated.

The general coloration of this species is clay color on the dorsal surface, cinnamon-buff on the ventral surface. Frequent specimens have the dorsal surface of the abdomen slightly darker at the caudal extremity. The eyes are blackish brown. The minute microscopic scale covering is moderately thick, the scales golden.

Frequent individuals of both the large and depauperate conditions have the caudal margins of the dorsal segments broadly but not strongly darkened. Such material, in consequence, has a banded appearance. This was supposed by Scudder to be peculiar to the depauperate condition, which he described as a distinct species, *nehawkae*. Such is not the case.

Much of the Arizonan material is of a maximum recessive coloration, light ochraceous-buff above and below. No trace of banding is shown by any of this material.

Specimens Examined.—82; 25 males, 37 females and 20 immature individuals.

Nebraska: West Point, V, 6 and 9, 1891, (L. Bruner), 4 ♂, 8 ♀, large and medium large, *type*, [Hebard Cln. and U. S. N. M.]. Weeping Water, (L. Bruner), 3 ♂, 11 ♀, 2 juv., small to very small, *type*, *allotype*, one *paratype* and *topotypes* of *M. nehawkae* Scudder, (host = *Tapinoma sessile* Say), [Hebard Cln., A. N. S. P. and U. S. N. M.].

Oklahoma: Ponca City, IX, 21, 1906, (A. C. Burrill), 1 small ♀, (host = *Crematogaster lineolata* Say), [Wheeler Cln.].

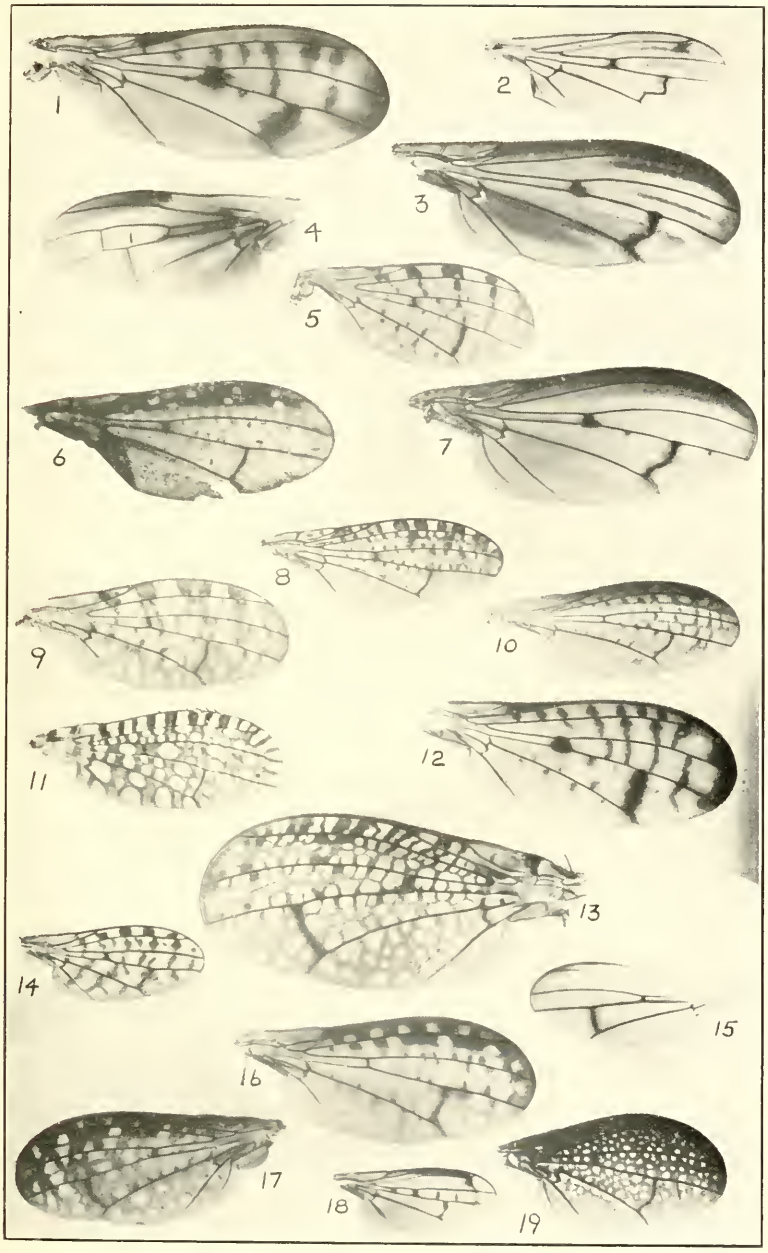
Texas: Austin, I, 26, 1903, II, 28, 1919, III, 1900, (W. M. Wheeler[32]), 3 ♂, 1 ♀, large, (host = *Formica rufibarbis* var. *gnava* Buckley), 5 ♂, 5 ♀, large to medium large, [A. N. S. P., Wheeler and Hebard Clns.].

[32] Dr. Wheeler states that in the vicinity of Austin, this species "is most abundant in company with *Formica fusca* var. *neorufibarbis* Mayr, less abundant in the nests of the Texan agricultural ant (*Pogonomyrmex barbatus* Sm.)—and rare in nests of *Camponotus castaneus* Latr., the Ponerine *Pachycondyla harpax* Fabr. and a species of *Crematogaster*." That author also states that the males of *nebrascensis* in the vicinity of Austin, bear to the females the ratio of about one to seven or eight.

New Mexico: Las Vegas, VIII, 8 to 13, (H. S. Barber), 1 large ♂, 1 large ♀, 1 small ♀, 1 very small ♀, 2 juv., (host = *Crematogaster lineolata* Say var.), [U. S. N. M. and Hebard Cln.].

Arizona: Grand Canyon, Coconino Plateau, 7000 feet, III, 21, 1919, (W. M. Wheeler), 2 juv. or very small ♂, (host = *Crematogaster lineolata* Say var.], [Wheeler Cln.]; 6800 feet, X, 6, 1919, (M. Hebard; under dark lava boulder in passages of ants nest in dark soil), 1 small ♂, [Hebard Cln.]. Oracle, 4000 ft., III, 12, 1919, (W. M. Wheeler), 2 medium ♂, (host = *Pogonomyrmex barbatus* var. *malefaciens* Buckley), 5000 ft., III, 11, 1919, (W. M. Wheeler), 1 medium large ♂, (host = *Liometopum apiculatum* Mayr), 1 very small ♀, (host = *Dorymyrmex pyramicus brunneus* Forel), 1 very small ♂, 1 very small ♀, (host = *Iridomyrmex pruinosus* var. *analis* André), 1 small ♂, 1 large ♀, 1 very small ♀, 11 small juv., (host = *Crematogaster lineolata* Say var.), [all Wheeler Cln.]. Post Canon, Pinaleño Mountains, VII, 18, 1917, (W. M. Wheeler), 1 ♂, 1 ♀, (host = *Formica rufibarbis* var. *gnava* Buckley), [Wheeler Cln.]. Huachuca Mountains, XI, 10 to 18, 1910, (W. M. Wheeler), 2 very small ♂, 3 very small ♀, 3 juv., (hosts = *Liometopum apiculatum* Mayr, *Pheidole desertorum* Wheeler, *Pheidole vastiti* var. *arizonica* Santschi, *Crematogaster lineolata* Say var.), [all Wheeler Cln.].

In addition to the localities given above, this species has been recorded by Scudder from Santa Fé, New Mexico. Lugger's record of a species of the genus from Minnesota may refer to this species. The specimen figured, which is the type, is, however, from West Point, Nebraska, and no definite data is given by that author for material from Minnesota.



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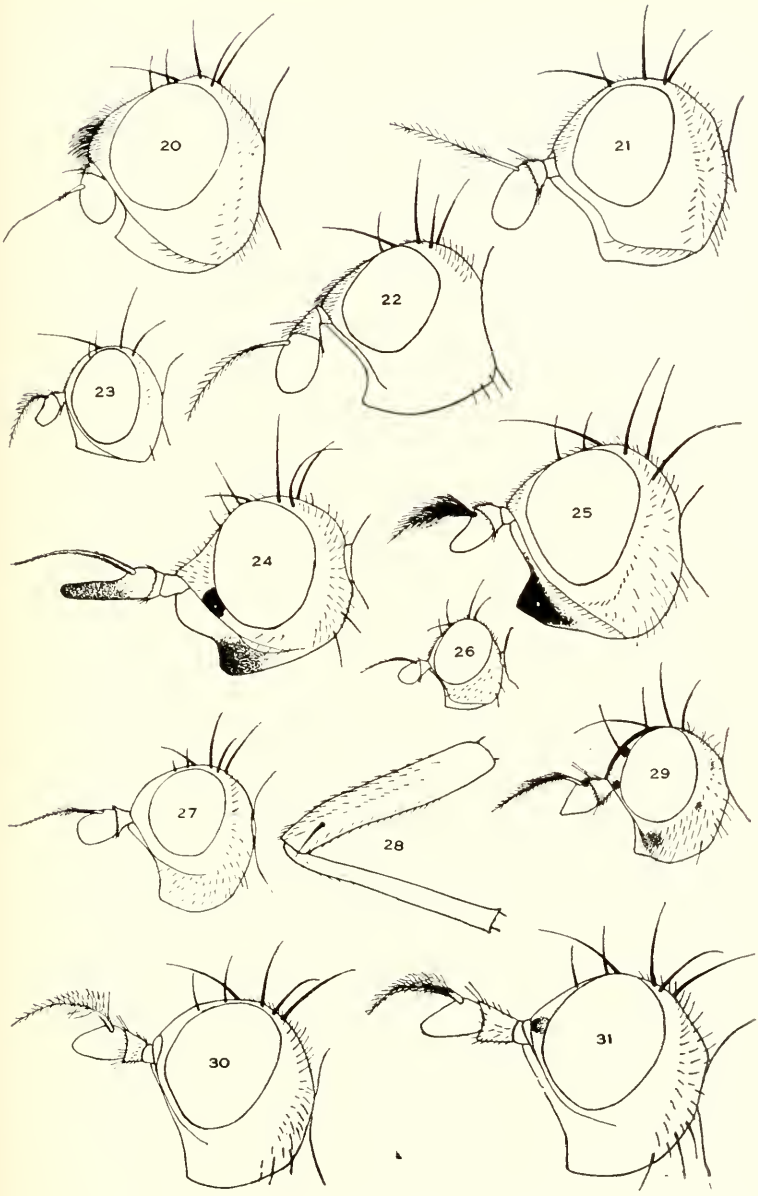

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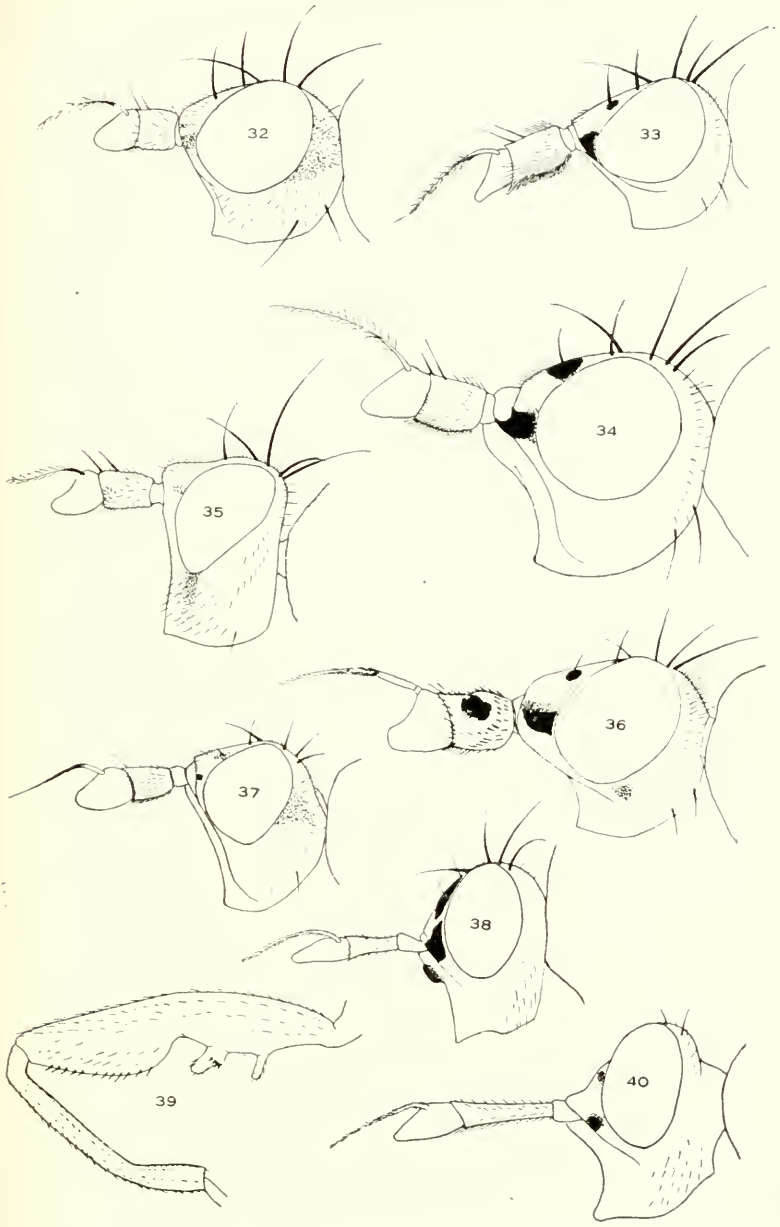

CRESSON—NEARCTIC SCIOMYZIDAE

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DESCRIPTIONS, RECORDS AND NOTES ON NORTH AMERICAN NYSSONIDAE

(HYMENOPTERA)

BY J. CHESTER BRADLEY

Cornell University, Ithaca, N. Y.

Gorytes (Hoplisoides) splendidula new species

Pale red (vinaceous rufous); posterior margin of pronotum, tubercles, scutellum, narrow apical margin of first dorsal and second ventral and broad apical band on second dorsal segments, buff (marguerite yellow), the scutellum a little deeper shade of yellow; there is an underlying yellow tone to the postscutellum, and the tibiae are slightly yellowish; the sutures of the apical segments of the male are a little dusky, and in the male paratype the last four abdominal segments are very dark red, almost black; the female lacks the buff on the pronotum, tubercles and second ventral segment, but has a buff spot on the fifth dorsal segment. Clothed with short appressed white pubescence, producing a white bloom, in places silvery sericeous. Wings hyaline, the fore-wing with a sharply defined fuscous spot occupying the marginal, second and third submarginal and apex of the third discoidal cells, another at the apex of the second discoidal, and a small spot at the apical angle of the medial cell. Length, 8 mm.

♂. Form robust, Nysson-like. Head broad, the eyes nearly parallel within; distance from front ocellus to clypeus no longer than the width of the front; front, vertex and clypeus uniformly but not conspicuously punctate; vertex with a slight ridge behind and laterad of the ocelli; antennae slender, the segments long, the third segment considerably longer than the fourth; flagellum slightly uneven, but neither crenulate nor dentate.

Mesonotum with well separated punctures. Mesopleura obscurely punctured, a weak carina separating them from the mesosternum; epicnemial area poorly defined, separated by a weak carina; scutellum and postscutellum with polished surface and few punctures; dorsal enclosure of propodeum striate and sharply marked off.

Abdomen rather closely punctate, especially at apex; second ventral segment slightly convex, not prominent.

♀. The segments of the flagellum more elongate than in the male, the first being longer than the distance between the hind ocelli; tarsal comb present; pygidium margined, forming an almost equilateral triangle, its surface with well separated punctures, in other respects like the male.

Habitat.—CALIFORNIA: Brawley in the Imperial Valley, August 9, 1914, two males, one female, (the author).

Types.—Holotype, ♂, Cornell University, no. 140.1; allotype, ♀, no. 140.2; paratype, ♂, no. 140.3.

This species resembles *dentatus* Fox in color, but is entirely different structurally. In Fox's tables the female would run near *spilopterus*, and the male near *pygidialis*, but it differs from both entirely in color and wing maculation, and by its much more slender antennae and elongate basal segment of the flagellum, as well as by other structural characters.

Gorytes (Hoplisus[1]**) angustatus** Provancher

California: Glenwood, May 27, 1908, three males, (the author), [Cornell University]; Claremont, one male, three females, (C. F. Baker), [Cornell University and Pomona College].

One of these females is typical, the other two lack the striae on the enclosure of the propodeum, which would throw them, by Fox's key, into *venustus*; their pygidia are also more sparsely punctured. In other respects and in color pattern they agree precisely with *angustatus*, while the color pattern of *venustus* is quite different, so I am inclined to look upon these as variants of *angustatus*.

Gorytes (Hoplisoides) pogonodes new species

♂. Black, the following parts yellow (pinard yellow): scape beneath, mandibles at base, labrum, clypeus, face below the antennae, broad stripe extending up the margin of the eyes to half-way between the base of the antennae and the ocelli; margin of pronotum, tubercles, spot beneath tegulae, apical half of scutellum, lateral spots on propodeum, broad subapical band on first segment, greatly narrowed medially, legs in front except the front or the front and middle trochanters, and behind in part; the tarsi are somewhat ferruginous especially toward apex, and the apex of the hind pair almost black; flagellum ferruginous beneath. Short silvery pubescence present but noticeable with difficulty. Wings nearly hyaline, a brown spot occupying the marginal and extending vaguely down through the second and upper part of the third submarginal cells. Length, 7.5 to 8.5 mm.

Head not as broad as the thorax; from in front round, with strongly converging, slightly emarginate eye margins; face narrow; clypeus convex, its anterior part deflected but not angled as in *hamatus*, its lateral angles slightly projecting, armed each with a tuft of hairs; clypeus and yellow parts of face

[1] I do not suppose that even a subgeneric distinction can be maintained between *Hoplisus* and *Hoplisoides*. I have not the opportunity at present, however, to review the species in order to reach a more certain conclusion, and therefore have used, as a matter of convenience, the term as defined by Ashmead and others.

almost impunctate; front moderately closely and coarsely punctate, vertex more sparingly punctate.

Mesonotum evenly but sparsely punctured; epicnemia and mesosternum separated from mesopleura by a sharp ridge; the latter sparingly punctured, with a nearly obsolete oblique dividing groove; scutellum and postscutellum shining, with a few punctures; dorsal triangular area of propodeum distinct and striate; just above the petiole is a longitudinal carina, on each side of which there are, in the holotype and some specimens, transverse carinulae; rest of posterior lateral surfaces punctate.

First dorsal segment polished and almost impunctate, remaining segments sparsely, toward the apex more closely, the last quite closely, punctate; second segment slightly constricted at base, the first not coaretate; second ventral segment convex but not very prominent.

Habitat.—CALIFORNIA: Lemon Cove, Tulare County, July 9 to 11, 1907, altitude 500 feet, five males, (the author), [Cornell University]. NEVADA: one male, [American Entomological Society].

Types.—Holotype and paratopotypes, males, Cornell University no. 141.1 to 141.5; paratype, ♂, from Nevada, in Coll. Amer. Ent. Soc.

This species is closely allied to *hamatus* and to *microcephalus*. From the former it is easily distinguished by the clypeus, which in *hamatus* is very prominent, and abruptly angled along a transverse line before the apex, while the bunch of curved hair on the angles is more prominent.

Gorytes (Hoplisoides) barbatulus Handlirsch

GEORGIA: Bainbridge, July 15 to 27, 1909, five males, [Georgia State Collection and Cornell University].

Gorytes (Hoplisoides) nebulosus Packard

GEORGIA: Bainbridge, June 2, 1911, one female, (the author), [Cornell University].

Gorytes (Hoplisoides) adornata new species

♀. Black, with yellow markings, red femora and ornate wings; the following parts are yellow (empire yellow): scape beneath, clypeus except basal line and semicircular median spot at apex, inner orbits up to half-way between base of antennae and the ocelli, short narrow line behind the eyes, almost interrupted line bordering pronotum behind, not continuous with yellow tubercles, superior spot on mesopleura, two large apical spots on scutellum, broad apical border of first dorsal segment, contracted medially, sinuate apical band on second, third and fourth dorsal segments, small spot on fifth, small spot at lateral apical angles of second ventral segment, apical spot on front and middle femora in front and on hind femora beneath, spot

at base of anterior tibiae merging into ferruginous at apex, and confluent with spot on outer side basad of the middle, front of middle tibiae, and spot on outside basad of the middle, and spot on outer side of posterior tibiae basad of the middle; the middle and hind femora are red except beneath; flagellum yellowish ferruginous beneath. The wings are hyaline with a fuscous spot occupying the marginal, second submarginal, upper and apical part of third submarginal cells, and extending vaguely down the second current vein, a second spot in the apex of the second discoidal cell, and small spots around the junction of the basal and submedian veins and at the apex of the median cell. Body clothed with short inconspicuous pubescence. Length, 9 mm.

Inner margins of the eyes parallel, farther apart than the distance from the front ocellus to the base of the antennae; clypeus strongly transverse, convex, with a row of setiferous punctures, its edge margined; front polished and impunctate as far up as the yellow intra-orbital lines extend, above which it is suddenly coarsely and closely punctate, with uneven surface; behind the ocelli the vertex is sparsely punctate. Flagellum short, somewhat clavate, the segments short, the first longer than the following.

Mesonotum deeply but not densely punctate, mesopleura sparsely but strongly punctured; epicnemia impunctate, at right angles to the plane of the mesopleura, from which they are separated by a sharp carina continuous with that separating the mesosternum from the same; metapleura impunctate, with a conspicuous pocket below; scutellum transverse, flat, sparsely punctured, postscutellum convex and more closely punctate; triangular area of propodeum with about eighteen slightly radiating strong carinae; posterior surface rugose, the angles coarsely reticulate. Tarsal comb present, middle and hind tibiae and tarsi spinose.

First segment sessile, not coarctate, polished and nearly impunctate; second dorsal segment with sparse shallow punctures, other segments less sparsely punctate; pygidium strongly margined, longer than broad, longitudinally striolate, the striolae anastomosing more or less.

The rufous of the femora may give way to fuscous at base, and the apical yellow spot on the hind femora may be in front instead of beneath, and beneath on the midale pair instead of in front, or both beneath and in front on the anterior pair.

Habitat.—California: Felton, Santa Cruz Mountains, May 20 to 27, 1907, 300 to 500 feet elevation, three females, (the author), [Cornell University, holotype and paratypes]; Giant Forest, Sequoia National Park, Tulare County, July 21 to 26, 1907, 6000 to 7000 feet elevation, one female, (the author), [Cornell University]; Glenwood, May 27, 1908, one female, (the author), [Cornell University]. New Mexico: Jemez Springs, May 27, 1916, one female, (John Woodgate), [Cornell University].

Types.—Holotype, ♀, Cornell University no. 142.1; paratypes, females, no. 142.2–142.6.

Most closely related to *spilopterus* and *nebulosus*, more remotely to *splendidulus*. These four species may be distinguished as follows:

1. Antennae slender, in the female the third segment longer than the distance between the hind ocelli. Color rufous, marked with yellow.
splendidula new species

Antennae short and thickened, the third segment not as long as the distance between the hind ocelli. Color black, with yellow and rufous markings.....(2)

2. Angles of propodeum coarsely rugose; abdomen scarcely punctate at base, shallowly and not coarsely punctate on the fifth dorsal segment; legs black, the femora and tibiae variegated with yellow and red; scutellum with two yellow spots; propodeum and abdomen without rufous.
adornata new species

Angles of propodeum not at all, or but slightly rugose; legs not colored as above; scutellum with an uninterrupted bar of yellow; abdomen punctate basally; the fifth dorsal more deeply and coarsely punctate..(3)

3. Legs red, the middle and hind tibiae yellowish at base; propodeum and base of first segment of abdomen red.....**spilopterus** Handlirsch

Legs castaneous, the middle and hind tibiae yellowish at base; propodeum and abdomen without red.....**nebulosus** Packard

Probably *spilopterus* should rank as a western race of *nebulosus*.

Gorytes (Hoplisoides) imperialensis new species

♂. Black, yellow and red; the following parts yellow (baryta yellow): scape and pedicel beneath, face below antennae, clypeus, labrum, mandibles except tips, stripe extending up along eye margins to two-thirds of the distance from the insertion of the antennae to the front ocellus, fine line on side of collar, broad posterior border of pronotum, continuous with tubercles, vertical stripe on mesopleura above, scutellum, spot on postscutellum, large lateral spots on propodeum, apical half of first dorsal segment, incised medially, sinuate apical bands on second to fifth dorsal segments, widened laterally, spot on ultimate segment, subapical band narrowed medially on the second and lateral spots on the third and fourth ventral segments, spot on all coxae in front, apical part of all tibiae beneath or behind, front and middle tibiae except beneath, and hind tibiae beneath only, front and middle tarsi entirely, and hind metatarsi except line beneath; the following parts are rufous, flagellum at base beneath slightly reddish, lateral surface of pronotum, sides of propodeum in front of and below yellow spots, shading into black anteriorly, sternum from in front of middle coxae to petiole, first and second ventral and extreme sides of first and second dorsal segments except where yellow, and legs entirely except where described as yellow. Body covered with short white pubescence, giving it a conspicuous grayish bloom. Wings stained slightly yellowish brown, and with a distinct golden reflection; a

brown spot occupies the marginal, second submarginal and most of the third submarginal cells and extends vaguely toward the wing apex. Length, 8 mm.

Eyes strongly converging, the width of the face about equal to the length of the scape; clypeus swollen, it and the yellow portions of the face and front scarcely punctate; the rest of front and vertex strongly but sparsely punctate; third segment of antennae little longer than the fourth, fourth to twelfth with more or less carinate lobes beneath, the ninth with a spine-like process, the tenth widened, the eleventh and twelfth with cicatrices beneath.

Mesonotum strongly and evenly but sparsely punctate; scutellum and postscutellum polished, with sparse punctures; mesopleura polished and shining, evenly but sparsely punctured, epicnemial area pronounced and forming almost a right angle with the mesopleura and mesosternum from both of which it is separated by a strong carina, as also the two latter from each other; basal triangular area of propodeum ill-defined and much obscured by vestiture, but striate; posterior surface closely, towards the sides more sparsely, coarsely punctate; lateral surfaces polished, sparsely punctate.

Dorsal and second ventral segments rather coarsely punctured; the second ventral not produced; the fifth with a lateral oblique process, as in *confertus*, but the inner edge thereof sloping and not hooked as in that species; third to sixth ventral segments inclusive with conspicuous silky pile.

Habitat.—California: Brawley, Imperial County, August 9, 1914, two males, (the author).

Types.—Holotype, ♂, Cornell University no. 143.1; paratype, ♂, no. 143.2.

This species may be distinguished from all others except *confertus* by the presence of laminae on the fifth ventral segment. From *confertus* it may be distinguished as follows:

Twelfth segment of the antennae with a carinate tubercle beneath; lamina of fifth ventral segment not so high and rounded, not hamate behind; abdomen closely and coarsely punctate, prothorax except dorsally, hind and middle coxae and first and second ventral segments, rufous.
imperialensis new species

Twelfth antennal segment simple; lamina of fifth ventral segment hamate behind; abdomen more sparsely punctate; prothorax, coxae and venter, entirely black ..... **confertus** Fox

Gorytes (Hoplisoides) insolitus Fox

California: Claremont, two males, (C. F. Baker), [Pomona College and Cornell University].

These differ in color from the types as follows: first dorsal, first and second ventral, second and third dorsal laterally rufous except where marked with yellow; third ventral also somewhat reddish; hind femora rufous except at base.

Fox is incorrect in stating that the mesosternum is ridged anteriorly; it and the mesopleura round gradually into the ill-defined epicnemial areas, without any carina except a weak one between the mesopleura and these areas; the groove between the mesopleura and mesosternum is almost obsolete. Despite this fact, the species can hardly belong in the subgenus *Arpactus*, as Ashmead has tentatively placed it.

Gorytes (Hoplisoides) denticulatus Packard

GEORGIA: Spring Creek, Decatur County, July 16 to 29, 1912, one female, (Cornell Univ. Expedition), [Cornell University].

Gorytes (Hoplisoides) tricolor Cresson

CALIFORNIA: Lemon Cove, Tulare County, July 9 to 11, 1907, 500 feet elevation, one male, one female, (the author), [Cornell University].

The male lacks the typical red of the propodeum, agreeing in this respect with a specimen from Montana in the collection of the American Entomological Society.

The species is allied to *pygidialis*, from which it can be better separated by the following characters, than by those given in Fox's tables:

Males

Sixth dorsal segment acute, coarsely rugose-punctate, not exposing the seventh; antennae serrate beneath ..... **pygidialis** Fox

Sixth dorsal short and broad, very obtusely rounded at apex, exposing the seventh segment, with few punctures; antennae scarcely serrate beneath. **tricolor** Cresson

Females

Pygidium strongly margined, acute and coarsely punctured. **pygidialis** Fox

Pygidium scarcely margined, broad, obtuse, polished and almost impunctate. **tricolor** Cresson

The enclosed area of the propodeum of *tricolor* appears normally to be striate, although it is nearly smooth in the type.

Gorytes (Hoplisoides) femoratus new species

♂. Slender; black, the following parts yellow (empire yellow): scape beneath, face, spot above antennae, clypeus, mandibles at base, palpi, inner orbits except above, broad margin of pronotum, not connected with small spot on tubercles, line within tegulae, spot on them and one below, vertical bar on mesopleura, scutellum, spot on postscutellum, large lateral spots on propodeum, apical half of first and second dorsal and second ventral segments, narrowed medially, broad apical bands on third ventral and third, fourth,

fifth and sixth dorsal segments, four anterior coxae in front, hind coxae except at base, four anterior trochanters except behind, hind trochanters at tip in front, four anterior femora except basal line above, hind femora except line above, four anterior tibiae except apical spot behind, hind tibiae except line behind, narrowed basally, front tarsi, middle metatarsi and hind metatarsi beneath; the following are ferruginous, flagellum beneath, apical segments of middle tarsi, and posterior tarsi except basal segment beneath. More or less shining, slightly punctate species, with inconspicuous pile. Wings stained brown, most deeply so in the region of the marginal cell; stigma and costa ferruginous. Length, 9 mm.

Eyes not emarginate, convergent below but the face not strongly narrowed; clypeus broad, convex, its margin broadly and shallowly emarginate, its surface and that of front with minute punctulation and sparse larger but small and inconspicuous punctures. Antennae long and slender, the third segment as long as the distance between the ocelli, the ninth widened beneath at apex, the tenth, eleventh, twelfth and thirteenth with inferior cicatrices, the twelfth with an acute inferior tooth.

Mesonotum with sparse inconspicuous punctures, scutellum and mesopleura polished and with few punctures; epicnemial areas rounding into the mesopleura and mesosternum, separated from the former by a carina which curves backward separating the mesopleura from the mesosternum. Triangular area of propodeum striate, posterior surface with a median longitudinal rugulose sulcus, area covered by yellow spots smooth and almost impunctate, cephalad of this, on sides, an oblique rugulose furrow, cephalad of which the surface is polished and impunctate.

Anterior femora widened medially.

First segment of the abdomen, while not petiolate, is slender, only slightly widened posteriorly; sixth dorsal segment short, broadly and obtusely rounded at apex, exposing the seventh, not at all coarsely punctate; the second ventral not prominent, the seventh ventral projecting as a deeply bifid process, the tynes acute; surface of the basal dorsal segments polished and impunctate, the apical segments and the ventral sparsely and shallowly punctate.

Habitat.—California: Claremont, one male, (C. F. Baker).

Type.—Cornell University no. 144.1.

This species is closely related only to *mirandus* and to *laminiferus*. The anterior femora of *laminiferus* have an enormous lamina beneath, in *mirandus* a deep fossa filled with white hairs; while the front femora of *femoratus* are swollen, they are much less so, and without a fossa beneath. In color, shape and sculpture *femoratus* resembles *mirandus*.

Gorytes (Arpactus) mendicus Handlirsch

1893. *Dienoplus pictifrons* Fox.

California: Felton, Santa Cruz Mountains, May 20 to 25, 1907, 300 to 500 feet elevation, one male, (the author), [Cornell University].

This male has the abdomen entirely red, and is only 5.5 mm. long. In other respects it agrees with *mendicus*, and with the type of *pictifrons* Fox. It lacks the basal striae in the enclosed area of the propodeum.

Gorytes (Arpactus) albitomentosus new species

♀. Black and rufous species, conspicuously and magnificently ornate with white tomentose pubescence. The following parts are black: head, mesonotum except lateral angles, fourth and fifth dorsal, fourth, fifth and sixth ventral segments, tip of posterior tibiae and their tarsi; the following are pale yellow: scape, except above, base of mandibles, clypeus except median basal spot, and short stripe along eyes below; the flagellum is brown above, ferruginous beneath, the rest is rufous (Brazil red). Except on the mesonotum, and in part on last three abdominal segments, strongly white pruinous to tomentose, a strong dense tomentose band on the posterior margin of pronotum and of the first three dorsal segment, and a patch occupying the disc of the fifth dorsal segment, pile also especially conspicuous on the mesopleura, sternum, coxae and basal ventral segments; except for the patch noted above, the fourth and fifth dorsal segments are covered with short, appressed, black pubescence. Wings weakly infuscated, without spots. Length, 8.5 mm.

Slender; face much narrowed below; a few small punctures on lower part of front and between the ocelli; antennae slender but not long.

Mesonotum impunctate, polished, as are the mesopleura wherever the pile is rubbed off; scutellum obscured by vestiture; epienemia rounded into the mesopleura and mesosternum, separated from the former but not from the latter by a groove, largely obscured by vestiture, which is continuous with the groove separating the mesopleura from the sternum; enclosure of propodeum polished, shining, not striate, with a deep median groove.

Tarsal comb long. Second submarginal cell receiving both recurrent veins comparatively close to one another; in the hind wings the cubitus arises beyond, but not far distant from, the apex of the submedian cell.

The first segment of the abdomen is subpetiolate; the fifth segment almost covers the pygidium, which is scarcely margined and smooth; the abdomen is not punctate.

♂. The male sex has much more black or dark rufous on the thorax, and the third abdominal segment black; the fourth dorsal segment has a white tomentose apical band, like the others, and the fifth has a band rather than a spot; the scape is black beneath, and also the face and clypeus, except for obscure lines along the eyes; there are some yellow markings on the forelegs.

The seventh antennal segment is nodose beneath, and the tenth distinctly notched, the ultimate is simple. The fifth dorsal segment is hood-like and almost covers the sixth, which is in turn rounded or hood-shaped at apex and exposes only a mere tip of the seventh.

Habitat.—California: Brawley, Imperial County, August 9, 1914, two males, two females, (the author), [Cornell University];

Claremont, two males, (C. F. Baker), [Pomona College and Cornell University]; "Cala." and "So. Cal.," two females, [American Entomological Society].

Types.—Holotype, ♀, Brawley, California, August, 9, 1914, Cornell University no. 146.1; allotype, ♂, Brawley, California, August 9, 1914, no. 146.2; paratopotypes, no. 146.3, 146.4, Brawley, California, August 9, 1914; paratypes, no. 146.5, Claremont, California, (Baker), one in collection of Pomona College and two females in collection of The American Entomological Society.

The two last mentioned females are darker, more like the males.

I think that there is little doubt but that this species is *Gorytes eximius* of Provancher (*nec* Smith 1862). Fox includes *eximius* in his key but does not mention it further. Handlirsch calls it unrecognizable even to genus. As the name *eximius* is preoccupied and would have to be changed anyhow, I have thought it better to redescribe the specimens before me as new, with the types more accessible, and *eximius* can take its place as a synonym, unless an examination of the type proves it different.

NYSSON

Key to the North American Species of the Subgenus Brachystegus[2]

1. Scutellum with a prominent reflexed margin.....(7)
   Scutellum not margined, or at least the margin not reflexed.....(2)
2. Posterior surface of propodeum with strongly developed carinae and usually more or less coarsely areolated; abdomen black, or at most with a red spot at base.....(3)
   Posterior surface of propodeum with two very feeble carinae or none at all, surface not areolated; abdomen mostly red, the apex black.....(6)
3. Base of propodeum with a series of slightly radiating carinae.....(4)
   Base of propodeum with a network of coarse meshes, of which the two or three in the middle are the largest, the lateral ones irregular.....(5)
4. Scutellum polished and shining, beset with coarse punctures; disc of first dorsal segment with moderately deep and conspicuous punctures; last segment of the male antennae obliquely truncate.
   albomarginatus Cresson
   Scutellum longitudinally rugulose; disc of first segment with small, shallow and inconspicuous punctures; last segment of male antennae acute.
   gagates new species

[2] *Clarconis* Viereck is omitted from this table. Two species of *Nysson*, *intermedius* Viereck and *aureobalteatus* Cameron, may also belong in this subgenus, but are omitted from the table as their subgeneric position is not evident.

5. Punctuation of dorsal surface of abdomen and of head fine, even and close, without minute interpunctulation; dorsal abdominal segments not fimbriate..... **maculipes** Mickel
Punctuation of dorsal surface of abdomen coarse, sparser, and with minute interpunctulation; first four dorsal segments albo-fimbriate.
moestus Cresson
6. Dorsal surface of propodeum uniformly reticulate... **trichrus** (Mickel)
Dorsal surface of propodeum with a basal series of parallel longitudinal areas..... **pumilus** Cresson
7. Abdomen black, or with only the first segment wholly or in part red..(8)
Abdomen, except for lateral whitish spots on segments one to five, entirely red..... **metathoracicus** Smith
8. Upper lateral angles of pronotum rounded.....(9)
Upper lateral angles of pronotum rectangular or with an acute tooth..(11)
9. Scutellum with slightly radiating carinae..... **seminole** new species
Scutellum coarsely punctured, or somewhat rugose.....(10)
10. Basal abdominal segment red; tubercle between the ocelli only slightly divided and not prominent..... **bellus** Cresson
Basal abdominal segment black; tubercle between the ocelli prominent, deeply divided..... **mellipes** Cresson and **submellipes** Viereck
11. Upper lateral angles of pronotum rectangular; legs black, the hind knees reddish; scutellum coarsely punctate; first abdominal segment black.
tramosericus Viereck
Upper lateral angles of pronotum acute; legs red, or middle and hind tibiae and tarsi black.....(12)
12. First abdominal segment red (or blackish medially at base), with interrupted yellow apical band.
opulentus Gerstaecker variety **basilaris** Cresson
First abdominal segment black, with interrupted white apical band.
opulentus Gerstaecker

Nysson (Brachystegus) gagates new species

♂. Black, except for a whitish fleck on each side of the first three dorsal segments. Except on the face, the silvery pubescence is inconspicuous. Wings hyaline or nearly so. Length, 5.5 mm.

Front and vertex closely, somewhat confluently punctate; vertex without a tubercle between the ocelli; first segment of the flagellum longer than the following, last segment acute.

Pronotum irregularly and rather roughly punctate; mesonotum with a deep median groove, its surface uniformly beset with moderately deep round punctures, the interstices polished and lacking interpunctulation; scutellum and postscutellum finely longitudinally rugulose, flat and not margined; mesopleura with large but shallow and inconspicuous punctures, without a clearly defined epicnemial area, with a short curved carina on its upper posterior surface. Dorsal surface of propodeum merging gradually without an angle into the posterior, bearing at base a transverse row of shallow, longitudinal, slightly radiating cellules, somewhat irregular and rather small, the

median ones no larger than the others; from these to the petiole a long and narrow area is set off, which is divided by smaller carinae into a row of shallow transverse cellules.

Punctuation of the abdomen small, shallow and inconspicuous, though rather close-set; it becomes coarser toward the apex of each segment; second ventral segment evenly convex, but not prominent at base; last dorsal segment with a pronounced median apical lobe between the two lateral teeth.

Habitat.—British Columbia: Downie Creek in the Northern Selkirk Mountains, August 9, 1905, one male, (the author).

Type.—Cornell University no. 135.1.

Nysson (Brachystegus) moestus Cresson

♀. Black; apex of middle femora, and vague stripe in front and behind on middle tibiae, hind femora except extreme base, and sides of first abdominal segment, rufous (Morocco red); apical stripe on each side of apex of first four dorsal segments, buff (cartridge buff), those of the first almost continuous, of the fourth very short; also an indistinct buff median line on the posterior margin of the pronotum. Most of the body with short appressed silvery pubescence; each dorsal segment argenteo-fimbriate.

Sculpture of head and thorax like that of the male; scutellum not margined, coarsely punctate; dorsal surface of propodeum meeting the posterior medially at quite an angle, irregularly very coarsely reticulate, the two median meshes larger and deeper than the rest; posterior surface with four prominent oblique carinae.

Second ventral segment prominently convex at base, but not angulate; pygidium long and narrow, distinctly margined, its surface longitudinally rugulose.

California: Felton, Santa Cruz Mountains, May 20 to 25, 1907, one male, one female, (the author), [Cornell University].

Allotype.—Cornell University no. 132.1.

As may be noted from the above description, this female differs from the male in bearing some red on its legs and abdomen. As it was captured at the same place (not necessarily on the same day) and agrees in sculpture, I do not hesitate to describe it as the female of *moestus*. The male agrees quite closely with the unique type specimen.

For some reason this species has been omitted from Fox's tables to our species.

Nysson (Brachystegus) maculipes (Mickel)

This species, a paratype of which is before me, is closely allied to *moestus*. Besides the characters mentioned in the key, which presumably will be true for either sex, although the male of *maculipes* is as yet unknown, the females differ as follows:

Pygidium broad, margined apically, only its surface with coarse regular and non-confluent punctures; legs and abdomen without red markings.
maculipes (Mickel)

Pygidium long and narrow, margined throughout, its surface longitudinally rugose; legs and abdomen partly red..... **moestus** Cresson

Nysson (Brachystegus) pumilis Cresson

♀. Black, the femora brownish black, the tibiae and tarsi ferruginous; spot beneath fore femora, posterior line and tubercles of pronotum, buff (marguerite yellow); apical margin of first five dorsal segments narrowly white (pale olive buff); abdomen with two basal segments, red (burnt sienna), and sides of two or three following. Surface of body covered with considerable fine white pubescence, giving it a silvery bloom, or in places it is distinctly sericeous.

Sculpture like that of the male; clypeus with close minute punctulation and scattered slightly larger punctures, front, vertex and dorsum closely and finely punctate; scutellum somewhat rugulose, flat and not margined; base of second ventral segment not prominent nor angled; pygidium margined, finely punctate.

California: Felton, Santa Cruz Mountains, May 15 to 19, 1907, 300 to 500 feet altitude, one female (*allotype*), two males, (the author), [Cornell University]; Harris, Humboldt County, June 29, 1907, one female, (the author), [Cornell University]; Claremont, one male, (C. F. Baker), [Pomona College].

Allotype.—Cornell University no. 133.1. The holotype of this species is in very bad shape, the head being gone and it is very mouldy. The males recorded above agree precisely with the type, as far as it is possible to observe.

Nysson (Brachystegus) seminole new species

♂. Black; broad posterior border of pronotum, with tubercles, base of scutellum, spot on outer side of posterior tibiae at apex, broad apical band on first dorsal segment, interrupted band on second, and lateral spots on third, fourth and fifth segments, yellow (maize-yellow); mandibles at base, first three segments of antennae beneath, and legs beyond the trochanters, rufous (mahogany red). Entire body covered with a short white pubescence, which gives it, in proper light, a strong white bloom; front and face strongly silvery-sericeous; wings weakly clouded around their margins. Length, 8 mm.

Front and vertex with strong separated punctures; a weak tubercle between the ocelli, divided by a shallow depression; last segment of antennae curved, obliquely truncate.

Lateral border of superior surface of pronotum entirely rounded, without angles; mesonotum strongly but not confluently punctate; scutellum with pronounced reflexed lateral margins, longitudinally canaliculate; mesopleura

prominent, with deep, well separated punctures, and a sharply differentiated epicnemial area, separated below and on the sternum by a carina. Propodeum irregularly sculptured, the upper surface with several small basal areas, the middle two of which are larger than the others and prominent posteriorly.

Dorsal surface of abdomen evenly covered with moderately coarse, not dense, punctures, these becoming closer toward the apex; second ventral segment strongly convex at base, but by no means truncate.

Habitat.—GEORGIA: Bainbridge, Decatur County, July 15 to 27, 1909, three males, (the author).

Types.—Holotype, ♂, Cornell Univ. no. 136.1; paratypes, two males, nos. 136.2, 136.3.

A male from Albany, Georgia (Georgia State Accessions, no. 1300) has the scutellum punctured posteriorly, weakly canaliculate in front.

This species is nearest *mellipes* and *submellipes*. From both it differs by the absence of two prominent ridges between the ocelli, by having the last segment of the antennae more deeply excised behind, as well as by the canaliculate scutellum.

Nysson (Brachystegus) opulentus subspecies **basilaris** Cresson

♂. The first abdominal segment black at base and medially; the hind tibiae and tarsi black. The scutellum is coarsely punctured except at base which is smooth.

GEORGIA: St. Simon Island, April 22 to May 12, 1911, one male, (the author).

Allotype.—Cornell University no. 137.1.

A close examination of the type of *basilaris* Cresson shows that the scutellum is really confluently punctured on the apical two-thirds, the walls of the punctures giving somewhat the appearance of longitudinal folds, as mentioned in Fox's key. I believe that this is really a southern form of *opulentus*, as it differs in no essential respect from a New York specimen assigned to that species by Fox.

Nysson (Nysson) sphecodoides new species

♂. Black; abdomen except last three segments and middle of fourth dorsal segment, red (morocco red); hind tarsi reddish; clypeus, scape beneath, obscure interrupted posterior border of pronotum, tubercles and front side of anterior tibiae, buff. Covered with a short silvery pubescence which gives the body everywhere a white silky bloom, on the front tinged golden. Wings slightly infuscated, more deeply around the margins. Length, 7.5 mm.

Robust; clypeus broadly rounded; front and vertex closely granular-punctate; ocelli facing dorsad, no prominence between them; first flagellar segment longer than the second, this shorter than the third, but both the second and third very short; penultimate swollen, last deeply incised behind and obliquely truncate.

Upper lateral angles of pronotum rounded; mesonotum very densely granular punctate; scutellum not margined, shallowly but more coarsely, somewhat confluently punctate; sculpture of postscutellum obscured by hairs; mesopleura prominent, with differentiated impunctate epicnemial area, rather obscurely and shallowly punctate; posterior surface of propodeum with rather numerous longitudinal wrinkles, converging toward the petiole, dorsal surface with a transverse row of small inconspicuous and irregular shallow meshes.

Dorsal surface of abdomen with small, sparse and shallow punctures; the last segment with two prominent teeth, the margin between which is straight; second ventral segment moderately convex at base.

Habitat.—California: Claremont, one male, (C. F. Baker).

Type.—Cornell University no. 1381.

This species is allied to *rusticus* Cresson, but differs as follows:

Clypeus with margin rounded; ocelli large; wings margined with fuscous; second, third and sides of fourth abdominal segments red; yellow marks on abdomen very indistinct ..... **sphecodoides** new species

Clypeus with its median portion broadly produced, squarely truncate, rectangular; ocelli small; wings not margined with fuscous; second, except base, third and fourth abdominal segments black; abdomen with yellow bars ..... **rusticus** Cresson

Proportions of ocelli

	Transverse diameter of hind ocelli	Their distance from the eyes	Their distance from one another
rusticus	6	16	13
sphecodoides	8	14	13

Nysson (Nysson) tristis Cresson

California: Between Kern Lake and Rock Creek, Tulare County, altitude between 6250 and 7000 feet, July 27 to August 1, 1915, one male, (the author), [Cornell University].

Nysson (Nysson) recticornis new species

♂. Black; mandibles at base, obscure spot on each side of clypeus, scape beneath, pronotal tubercles, front and middle tibiae externally, line on posterior tibiae externally, and transverse spots on first three dorsal segments, buff; rest of tibiae and tarsi somewhat ferruginous. Body with short white silky pubescence. Wings nearly hyaline. Length, 3.7 mm.

Area bearing ocelli slightly elevated, but no distinct tubercle between them; vertex rather sparsely, front densely punctate; clypeus with rounded

margin; antennae thickened apically, the last segment elongate, straight, acute, not excised behind, the penultimate segment long but not swollen, the third segment longer than the short and subequal fourth or fifth.

Pronotum with upper lateral angles entirely rounded. In most species the part of the pronotum bordering the mesonotum forms a transverse narrow dorsal piece, rather sharply differentiated from the forward sloping portion, but in this species this area merges gradually into the latter and is scarcely distinct; mesonotum polished, with separated, round punctures; scutellum margined, but not prominently so, flat and punctate, its surface polished; mesopleura with sculpture largely obscured by vestiture, the epicnemial areas not separated below and on the mesosternum by a carina; propodeum rugose posteriorly, the dorsal surface with a row of elongate meshes.

Dorsal surface of abdomen with shallow scattered punctures and obscure interpunctulation, second ventral segment slightly produced medially at base, but not truncate.

Habitat.—California: Felton, Santa Cruz Mountains, May 20 to 25, 1907, 300 to 500 feet elevation, two males, (the author).

Types.—Holotype, ♂, Cornell University no. 139.1; paratype, ♂, no. 139.2.

This species comes nearest to *simplicornis* of Fox, in which species the scutellum is not margined, nor flat, the mesonotum densely and coarsely punctate, and the size larger. Cameron's *cressoni* known only from the female sex, also appears to be allied.

Nysson (Paranysson) texanus Cresson

Georgia: Spring Creek, Decatur County, July 16 to 29, 1912, one male, (Cornell Univ. Expedition), [Cornell Univ.]; Waynesville, September 10, 1909, one female, (the author), [Georgia State Collection]. Illinois: Virginia, September 13, 1904, one female, (J. G. Needham), [Cornell Univ.].

DIDINEIS

Didineis nodosa Fox and *peculiaris* Fox together form a group entirely distinct from the other known species of the genus, by reason of certain peculiarities of the males. These comprise not only the curious structure of the antennae described and figured by Fox, but, of greater importance, the structure of the fore-legs. The front femora are greatly widened, lamelliform, subtriangular, concave beneath, so as to form a shield-like cover for the tibiae, suggestive of the shield on the tibiae of certain Crabronidae; the front tarsi are greatly widened and completely flattened.

In the other species the femora are cylindrical or tapered, and the tarsi cylindrical and slender.

Didineis nodosa Fox

California: Mountains near Claremont, one male, (C. F. Baker), [Cornell Univ.].

So far as I am aware this is the second recorded specimen of this species.

Didineis texana (Cresson)

Georgia: Billy's Island, Okefenokee Swamp, June, 1912, one female, (Cornell Univ. Expedition), [Cornell University]; Tybee Island, July 26, 1913, one female, (J. C. Bradley), [Cornell Univ.].

Didineis sanctacrucae new species

♀. Black; first three segments of abdomen rufous (mahogany red); tibiae and tarsi brownish, the former with a pale streak in front; clypeus and basal half of mandibles yellow (chamois); scape beneath whitish (pale olive buff). Wings stained slightly fuscous, especially in the region just apicad of the stigma. Head and thorax clothed with a noticeable short white pubescence. Length, 7 mm.

From a lateral view the front is prominently convex, the dorsal surface of the head and the cephalic surface being in planes almost at right angles to one another, which merge comparatively abruptly. Seen from above the front is filled out to the level of the eyes, these not being prominently raised above the surface of the head as in *texana*. The front and vertex are more closely punctate than in *texana*, evenly throughout; there is no median groove, but a slightly raised median area just above the antennae; the margins of the antennal sockets are nearer to one another than to the eyes; the margin of the clypeus bears three rounded teeth, less prominent than in *texana*.

The thorax is sculptured almost as in *texana*, but the dorsum more closely and coarsely punctate, opaque and not shining as in *texana*. Scutellum sparsely punctate, smooth and polished medially; propodeum rugulose, its dorsal surface with three longitudinal or oblique lines meeting in a rounded point behind.

This species is quite close to *texana*. In that species, besides the points of difference noted above, the eyes are prominent, the dorsal surface of the head more gradually rounded into the cephalic; the antennal orifices are farther apart than their distance from the eyes; there is a slight median depression on the front; the front and vertex are polished and more finely punctured, and the abdomen is red throughout.

Perhaps this species is really the female of *D. nodosa* Fox.

Habitat.—Santa Cruz Beach, California, two females, May 14 or 18, 1907, collected by the author.

Types.—In Cornell University. Holotype ♀, no. 520.1; paratype ♀, no. 520.2.

ALYSSON

Alysson melleus Say

Quebec: Montreal, July 10, 1902, one male, [Cornell University]. New York: Ithaca, August 7, 9, 10, 13, 31, 1916, seventeen females, twenty-four males. Georgia: Spring Creek, Decatur County, July 16 to 29, 1912, two males, (Cornell Univ. Expedition); May 18 to 21, 1916, three females, (J. C. Bradley), [Cornell University]. Thomasville, April 27, 1915, one female, (C. S. Spooner). Bainbridge, July 15 to 27, 1909, one female, (J. C. Bradley). Tallulah Falls, July 19 to 25, 1909, one female, (J. C. Bradley). Florida: Dunedin, March 16, 1914, one male, (W. S. Blatchley), [Cornell University]. Tennessee: Memphis, July 16, 1914, one female, (J. C. Bradley), [Cornell University]. Texas: El Paso, July 24, 1914, two females, (J. C. Bradley), [Cornell University].

Alysson oppositus Say

Quebec: Montreal, September 10, one female, August 17, 1901, one female. Joliette, July 19, one male. New York: Wilmington, Essex County, August 20 to 25, 1916, 1000 to 2200 feet, one female. Adirondack Mountains, August 8, one female. Ithaca, August 10 and 13, eight females. [All in Cornell University].

Alysson trianguliferus Provancher

New York: Ithaca, one female; June 23, 1908, one female; August 14, 1891, one male. Mud Creek, Tompkins County, June 17 to 20, 1904, two males, (A. D. MacGillivray and J. C. Bradley). [All in Cornell University].

Alysson conicus Provancher

Ontario: Waubamic, August 6, 1915, one female, (H. S. Parish). New York: Wilmington, Essex County, August 20 to 25, 1916, one female. Rhinebeck, July 27, 1907, one male, (C. R. Crosby). Middletown, July 2 to 20, 1910, one male, (C. S. Spooner). Van Cortland Park, July 20, 1916, one male. [All in Cornell University].

Alysson shawi new species

♂. Black; the front and middle femora and tibiae and more or less of trochanters and hind tibiae ferruginous; the hind tarsi ferruginous but somewhat infuscated; the front and middle tarsi jet black, as also the hind femora, and the hind and middle coxae; the front coxae with a yellow apical spot in front; face, extended upward along the eyes, mandibles except tips, clypeus, scape beneath, posterior extensions of pronotum and lateral spots on second dorsal segment, yellow (colonial buff); antennae pale in front except at tip. Wings hyaline. Length, 6 mm.

Dorsum shallowly and sparsely punctured; mesopleura not striate, scarcely punctate. Area on propodeum sharply triangular, nearly as broad at base as long, filled with numerous radiating carinae. Second recurrent vein opposite the second transverse cubitus.

♀. Black; the legs except coxae, the first dorsal abdominal segment except narrow apical band, and base of second dorsal and ventral segments ferruginous; front coxae with a pale but not yellow apical spot in front; short line within the eyes by the bases of the antennae, scape beneath, and spots on second segment, yellow (colonial buff), the edge of clypeus and mandibles a more obscure reddish yellow, the latter darker toward apex. Wings slightly infuscated. Length, 6.5 mm.; of paratype, 8 mm.

Sculptured as in the male, except that the areola on the propodeum is a little less triangular, the sides slightly convex.

Habitat.—British Columbia: Carbonate, on the Columbia River, July 7 to 12, 1908, altitude 2600 feet, three males, two females, (collected by the author). Nevada: one male, [American Entomological Society].

Types.—In Cornell University. Holotype, ♂, no. 131.1; allotype, ♀, no. 131.2; paratype, ♀, no. 131.3.

Another female from the same place and collected at the same time as the type seems to belong to this species, but several of the radiating carinae of the propodeum are suppressed. The first dorsal segment is entirely ferruginous in this specimen. A second male collected at the same time and place, unfortunately has been pinned directly through the areola of the propodeum, but looks as though the condition of the areola had been almost in the female just mentioned. In other respects the male is typical. Another male, taken at the same time and place, agrees entirely with these in color, but the propodeal areola is precisely as in *triangulifer*us. I can not at present look upon it other than as a variant of *shawi*, but it raises the question as to whether the precise conformation of this areola is as significant in some of the species of *Alysson* as has heretofore been supposed. The female paratype is larger than the allotype, and the areola of the propodeum less triangular.

The transition from the *radiatus* type of *areola* to that of *triangulifer*us could very easily be affected by the suppression of all but two of the radiating carinae.

The type of this species gives the impression of being most closely related to *A. radiatus* Fox. If, however, the several other specimens mentioned above really belong to it, representing slight variations in the propodeal areola, I am inclined to believe that its closest relative is *A. triangulifer*us. In fact it may very well represent a northwestern race of that species. It also is

undoubtedly related to *conicus*, or at least to the male described by Fox as belonging to that species.

I take pleasure in dedicating this species to the late Dr. Charles H. Shaw, leader of several parties of botanists and others into the Rocky and Selkirk Mountains of British Columbia, with whom the author spent parts of two very pleasant summers, during one of which he captured the types of the species.

DESCRIPTIONS OF NEW NORTH AMERICAN ANTHOMYIIDAE (DIPTERA)

BY J. R. MALLOCH

The present paper was originally prepared with a number of tables of species and references to previously known forms included. Editorial necessity and limitations of space have made necessary the restriction of the matter to the description of new species. The accompanying plates, however, contain illustrations of a number of previously known species, which it seemed best to have appear at this time. Reference subsequently will be made to these illustrations.

Phaonia basiseta sp. n.

Male and female.—Black, slightly shining, densely yellowish brown pruinescent. Thorax with four black vittae. Abdomen with a poorly defined dorso-central black vitta and irregular checkerings. Wings clear, yellowish at bases. Calyptrae and halteres orange yellow.

Male.—Eyes distinctly hairy, separated at narrowest part of frons by a distance about equal to width across posterior ocelli; parafacial in profile much wider than third antennal joint and about half as wide as height of cheek, the latter with numerous moderately long marginal bristles, the upper series upwardly curved; vibrissa in line with lower margin of eye and much above lower margin of cheek, a few short bristles above vibrissa; antennae about two-thirds as long as face, third joint about 1.75 as long as second; arista with its longest hairs slightly shorter than width of third antennal joint. Thorax with four pairs of postsutural dorso-central bristles, no long presutural acrostichals, and the prealar bristle over half as long as the one behind it; hypopleura with a number of hairs on its upper margin in front of spiracle. Abdomen narrowly ovate; fifth sternite inconspicuously bristled. Fore tibia with two or three postero-ventral bristles; fore tarsus longer than fore tibia; mid femur with a few long bristles on basal half of postero-ventral surface; mid tibia with three or four postero-dorsal and three or four posterior bristles; hind femur with a series of bristles on the antero-ventral and another on the postero-ventral surface, the latter series sparse and the bristles short in middle; hind tibia with two or three antero-ventral and from four to six antero-dorsal bristles, the postero-dorsal surface with one or two short bristles near base in addition to the preapical calcar. One of the costal thorns much longer than the other; outer cross-vein slightly bent.

Female.—Eyes with very short hairs; frons narrowed slightly at vertex where it is less than one-third as wide as head. Abdomen with apex pointed, fourth tergite longer than third; genital processes of moderate length, with

numerous short, erect, stiff, and a few long slender hairs. Fore tibia with an antero-dorsal and two postero-ventral bristles; mid tibia with two antero-dorsal bristles in addition to the same bristles as in the male; hind femur with very short weak postero-ventral bristles. Costal thorns both very long. Length, 7 to 8 mm.

Type.—♂; Bozeman, Montana, June 18, 1913, [Montana Exper. Sta.]. *Paratypes.*—Bozeman, Montana, July 6, 1916; Waubay, South Dakota, June 6, 1918, (Aldrich). Three females and two males.

Mydaea occidentalis sp. n.

Male.—Similar in color to *pagana* Fabricius. The female has the anterior lateral angles of the thorax broadly testaceous yellow.

The eyes of the male are separated at narrowest part of frons by at least as great a distance as width across posterior ocelli, while in *pagana* they are separated by about the width of anterior ocellus. The prealar bristle is much shorter than in *pagana*, and the male has no strong bristles on the sides of the posterior margin of the fourth tergite, but has two or more strong bristles on each side of fifth sternite, which are absent in *pagana*. Length, male, 6 mm.; female, 6.5 mm.

Type.—♂; Base Station, Mt. Washington, New Hampshire, July 7, [Boston Soc. Nat. Hist.]. *Allotype.*—♂; Bashbish Falls, Massachusetts, June 27, 1912, [Illinois].

I have seen no North American specimens of *pagana*. The European species *tincta* Zetterstedt is closely related to *occidentalis*, but the male has the eyes closer, and both sexes have the hind tibia with four or five, instead of two or three, antero-dorsal bristles.

Mydaea persimilis sp. n.

Male and female.—This species along with *urbana* and *discimana* is black, slightly shining, covered with rather dense yellowish gray pruinescence, has the thorax quadrivittate and the abdomen with a dorso-central black vitta, and the legs yellowish testaceous. The wings in all three species are yellow at bases and the cross-veins are not infuscated. The antennae are entirely black in *persimilis*, and all the femora are pale in the female, while in the male they are largely blackened.

Structurally this species is similar to *urbana*, differing most noticeably in having the arista with short hairs, the longest of which are decidedly shorter than the width of third antennal joint; the prealar bristle is nearly half as long as the bristle behind it. Fore tarsi normal in form in female; fore tibia without median bristle. Fifth sternite in male with the posterior incision not regularly rounded as in *urbana*, the form in both species as shown in figures 3 and 4. Length, 6 to 8 mm.

Type.—♀; Lake Louise, Alberta, Canada, August 15, 1908, (Dr. C. S. Minot), [Illinois]. *Allotype.*—♂; Kodiak, Alaska,

June, 1917, (J. S. Hine). *Paratypes.*—Females; Mt. Ascutney, Vermont, July 11, 1908, (C. W. Johnson); Great Caribou Island, Labrador, July 27, 1906; Kodiak, Alaska, June, 1917, (J. S. Hine); male; Kodiak, Alaska, (J. S. Hine).

Mydaea brevipilosa sp. n.

Male.—Similar to *persimilis* in habitus. Differs in having the fore femora pale, and the tarsi but little darker than the tibiae.

The arista has slightly longer hairs than in *persimilis*, the longest being almost as long as the width of the third antennal joint, and the hind femur has a few bristles on middle of postero-ventral surface, instead of on basal half as in *persimilis*.

Female.—Colored as the female of *persimilis*, but the second antennal joint is paler.

The parafacials are broader than in *persimilis*, and the arista shorter haired. Length, 6 to 8 mm.

Type.—♀; Algonquin, Illinois, July 2, 1904, (W. A. Nason), [Illinois]. *Allotype.*—♂; Ira, Summit County, Ohio, (J. S. Hine). *Paratypes.*—Males; Savanna, Illinois, June 13, 1917, (J. R. Malloch); Ira, Summit County, Ohio, (J. S. Hine); Manchester, Vermont, June 4, 1910, (C. W. Johnson); Stonington, Connecticut, June 15, 1906, (W. E. Britton); females; Ira, Summit County, Ohio, (J. S. Hine); St. Albans, Vermont, June 21, 1917, and Brattleboro, Vermont, July 15, 1908, (C. W. Johnson); Fogo Island, Newfoundland, July 29, 1908; Rigaud, Canada, July 28, 1911.

Mydaea armata sp. n.

Female.—Black, slightly shining, covered with dense yellowish brown pruinescence. Head, including antennae and palpi, black, the face and cheeks obscured by dense yellowish brown pruinescence. Thorax less conspicuously quadrivittate than in *urbana*. Abdomen indistinctly checkered on dorsum. Legs reddish yellow, the greater portion of fore femora and all tarsi, fuscous. Bases of longitudinal veins, calyptrae and halteres orange-yellow.

Head in type slightly shrunken; each orbit with seven or eight strong bristles and numerous setulose hairs; antennae shorter than in other species of *Mydaea*, arista with the longest hairs barely longer than its basal diameter; cheek higher than width of third antennal joint, the lower margin with a rather closely-placed series of strong bristles, above which are numerous hairs and, at middle, one upwardly directed bristle. Thorax and abdomen as in *urbana*. Fore tibia with two bristles at middle, one posterior, and one postero-ventral; mid femur with a series of seven or eight strong bristles on basal half of postero-ventral surface; mid tibia with one postero-ventral and two posterior bristles; hind femur with a series of strong bristles from

base to apex on antero-ventral surface; hind tibia with two antero-dorsal and three or four antero-ventral bristles. Veins three and four very conspicuously divergent at apices. Length, 10 mm.

Type.—♀; Gallatin County, Montana, July 12, 1900, (E. Koch), [Illinois].

In the armature of the legs and the short-haired arista this species shows a departure from the general rule in this genus, but, as *persimilis* has the arista almost the same, I place *armata* in *Mydaea*, though I am unable to ascertain whether the structure of the penultimate abdominal segment corresponds with that of *urbana* and its allies.

Mydaea discimana sp. n.

Male and *female.*—Similar in color to *persimilis*, femora and bases of wings yellow in both sexes.

Female.—Structurally closely resembles *persimilis*, but the fore tibia has a strong posterior bristle at middle, and the apical joint of fore tarsus is very conspicuously broadened, being as broad at the middle as it is long.

Male.—Very similar in general structure to the male of *neglecta*, the prealar bristle shorter than in *persimilis*, and the fore tarsus with the apical joint slightly but distinctly broadened. Length, 7.75 mm.

Type.—♀; New Bedford, Massachusetts, (Hough), [Illinois]. *Allotype.*—♂; Chester, Massachusetts, May 28, 1912, (C. W. Johnson). *Paratypes.*—Males and females; Chester, Massachusetts, August 5, 1911; Sharon, Massachusetts, August 3, 1909; North Adams, Massachusetts, August 16; Williamsburg, Massachusetts, July 7, 1911; Glen House, New Hampshire, July 15, 1916; Bretton Woods, New Hampshire, June 24, 1913; Echo Lake, Mt. Desert, Maine, July 12, 1918; Machias, Maine, July 21, (C. W. Johnson). Eleven specimens.

Mydaea neglecta sp. n.

Male and *female.*—Similar in color to *persimilis* and *urbana*, the fore femora of male largely blackened, and sometimes the bases of the mid pair also.

Structurally this species agrees closely with *discimana*, differing in having the apical joint of fore tarsi slender in both sexes. Length, 7 to 9 mm.

Type.—♂; Ramsey, New Jersey, June 5, 1916, [Illinois]. *Allotype.*—♀; New Bedford, Massachusetts, August 30, 1896, (Hough). *Paratypes.*—Males; Plummer's Island, Maryland, May 10, 1916, (W. L. McAtee); Delaware County, Pennsylvania, May 5, 1895 (named *alone* Walker by Coquillett, but according to Stein, who has examined the type of Walker's species, *alone*

is a synonym of *ausoba* Walker, which belongs to the genus *Coenosia*); North Mountain, Pennsylvania, September 1; Falls Church, Virginia, June 28, 1912, (C. T. Greene); Rowayton, Connecticut, June 16, 1909; Danbury, Connecticut, June 15; Mt. Ascutney, Vermont, July 11, 1908; Brookline, Massachusetts, September 6; Sharon, Massachusetts August 3; Chester, Massachusetts, July 25, 1913; Buttonwoods, Rhode Island, June 22, 1912, (C. W. Johnson); Broad Top, Texas.

One male from the same place, and with the same date, as the type differs from it in having the fore femora pale, but in other respects agrees with it and evidently is the same species.

Helina hylemyioides sp. n.

Female.—Black, covered with yellowish gray pruinescence. Head entirely black. Thorax subopaque, with two narrow, distinctly separated vittae on anterior half between the dorso-centrals. Abdomen with an irregular central stripe and lateral checkering on dorsum. Legs black. Wings yellow at bases, the cross-veins slightly infuscated. Calyptrae yellow. Halteres yellow.

Frons at least one-third as wide as head at vertex, slightly broadened anteriorly, triangle very short, orbits narrow, with a few setulose hairs in addition to the five to six bristles; eyes almost bare; third antennal joint narrow, reaching almost to mouth-margin; arista haired to apex, the longest hairs about as long as width of third antennal joint; cheek slightly over one-third as high as eye, marginal bristles irregular, the upper two or three rows weak, no upwardly curved bristles present. Thorax without strong presutural acrostichals; postsutural dorso-centrals, three; prealar bristle long; sternopleurals, three, the lower posterior one weak; ventral surface of scutellum with weak erect hairs to apex. Basal abdominal sternite with a few setulose hairs. Fore tibia with one posterior bristle; fore tarsi not thickened, longer than tibia; mid tibia with one or two antero-dorsal, two postero-dorsal, and two or three postero-ventral bristles; hind femur with long hair-like bristles from base to near apex on postero-ventral surface, and a few stronger bristles on apical half of antero-ventral surface; hind tibia with two strong antero-dorsal and four weaker antero-ventral bristles. Third vein bare at base; costal thorns long; veins three and four divergent apically. Length, 7 mm.

Type.—♀; Field, British Columbia, July 2, 1906, (S. Brown). [A. N. S. P., Type no. 6224]. *Paratypes.*—Females; Grant, Colorado, altitude 9500 to 10,000 feet, July 21 and 22, 1906, (L. O. Jackson).

This species bears a close resemblance to the group containing *lucorum*, but has only three sternopleural bristles. The scutellum

in *lucorum* Fallen, *punctata* Stein, *multisetosa* Schnabl and *brevis* Stein is haired on the sides, and usually also on part of the ventral surface.

Helina tuberculata Malloch.

Female.—Black, densely brownish gray pruinescent. Thorax quadrivittate. Dorsum of abdomen irregularly checkered. Bases of wing-veins yellow; cross-veins narrowly infuscated. Calyptrae and halteres orange yellow.

Eyes separated by over one-third of the head-width; parafacial in profile much wider than third antennal joint and half as wide as height of cheek; longest hairs on arista not longer than its basal diameter. Presutural acrostichals absent; postsutural dorso-centrals four; prealar over half as long as the bristle behind it; hypopleura bare; sternopleurals 1.2. Basal abdominal sternite bare. Fore tibia with a strong median posterior bristle; mid tibia with two antero-dorsal and three or four postero-dorsal bristles; hind femur with a few bristles at apex on both antero- and postero-ventral surfaces; hind tibia with from three to five bristles on both antero-ventral and antero-dorsal surfaces. Outer cross-vein curved inward at middle; veins three and four distinctly divergent at apices. Length, 9.5 mm.

Locality.—Lake Louise, Alberta, Canada, July 15, 1908, (Dr. C. S. Minot), [Illinois].

Superficially this species very closely resembles the species of the *lucorum*, group but the arista has very much shorter hairs and the hypopleura is bare, while the scutellum has the sides and ventral surface bare, characters which readily separate it from that group. I recently described this form from the male sex, but did not at that time recognize the female of the species.

Helina nasoni sp. n.

Male.—Deep black, almost glossy, with slight grayish pruinescence, most distinct on abdomen when viewed from behind. Thorax distinctly quadrivittate. Abdomen usually with a pair of large, elongate, poorly-defined black spots on segments two and three, the dorsum of all segments irregularly checkered. Legs black. Wings slightly infuscated at bases. Calyptrae yellowish white. Halteres yellow.

Eyes sparsely haired, separated at narrowest part of frons by a distance distinctly greater than width across posterior ocelli; orbits linear, not more than one-third as wide as interfrontalia on upper half; antennae shorter than face, third joint slightly broadened apically, at least twice as long as second; arista with the longest hairs as wide as third antennal joint; parafacial in profile at base of antennae about as wide as third antennal joint, slightly narrowed below, at its widest point about half as wide as height of cheek, the latter with numerous marginal bristles, the upper two or three rows much shorter and weaker than the lower one, and distinctly upwardly curved

anteriorly; a few short bristles above level of vibrissa. Thorax without strong presutural acrostichals; postsutural dorso-centrals, four; prealar a little less than half as long as the bristle behind it; sternopleurals 2:2; hypopleura sometimes with a few weak hairs below the spiracle. Abdomen subcylindrical, tapered apically; first sternite with bristly hairs; fifth sternite hairy on entire disc, the hairs stronger and longer on lateral apical angles, postmarginal emargination shallow, rounded. Fore tibia unarmed at middle; fore tarsus longer than tibia; mid femur with two or three long bristles and a series of long hairs on postero-ventral surface, and a series of short hairs on antero-ventral; mid tibia rarely with an antero-dorsal bristle, normally with two postero-dorsal bristles; hind femur with a series of very long strong bristles on entire length of antero-ventral surface, without postero-ventral bristles except at apex; hind tibia with from three to five antero-ventral, and two or three antero-dorsal bristles, and a few setulae on postero-dorsal surface at middle; all claws and pulvilli large. Costal thorns unequal in length, the longest longer than inner cross-vein; outer cross-vein sinuate; veins three and four divergent at apices. Length, 8 to 9 mm.

Type.—♂; Algonquin, Illinois, August 16, 1895, (W. A. Nason), [Illinois]. *Paratypes*.—Males; Fort Wrangel, Alaska, (Wickham); Grand Lake, Newfoundland, July 25 and August 1. Four specimens.

Helina nigrita sp. n.

Male.—Similar to *nasoni* in color.

Differs from *nasoni* in having the third antennal joint much shorter and stouter, the thorax with three pairs of postsutural dorso-centrals, prealar bristle very short or absent, basal abdominal sternite bare, fifth sternite with some strong bristles on each side in line with inner extremity of posterior excision, mid tibia with three very long bristles on the posterior surface and two short ones on the antero-dorsal. Length, 7 mm.

Type.—♂; Monida, Montana, July 27, 1913, [Illinois]. *Paratype*.—1 ♂, topotypical, [Mont. Exper. Sta.].

Helina neopoeciloptera nom. nov.

1918. *Aricia poeciloptera* Malloch [nec Stein], Trans. Amer. Ent. Soc., xliv, p. 271.

I inadvertently created a homonym in my previous paper on this family in this journal, and it is here proposed that the name be changed as above.

Helina linearis sp. n.

Male.—Black, subopaque, densely covered with pale gray pruinescence, appearing gray, the thorax very indistinctly quadrivittate, the abdomen with faint traces of a black dorso-central vitta. Head with the orbits and cheeks covered with dense white, almost silvery, pruinescence; antennae

black; palpi testaceous. Legs yellowish testaceous, coxae largely fuscous, fore femora with a fuscous stripe on postero-dorsal surface, tarsi black. Wings clear. Calyptrae and halteres whitish yellow.

Eyes nude, separated at narrowest part of frons by about three times the width across posterior ocelli; orbits moderately wide, each about half the width of interfrontalia; parafacial in profile about 1.5 as wide as third antennal joint and half as wide as height of cheek, the latter with a series of bristles on margin, above which there are a few weak hairs; antennae shorter than face, third joint narrow, about twice as long as second; arista with the longest hairs distinctly longer than width of third antennal joint. Thorax without strong presutural acrostichals, with three pairs of postsutural dorsocentrals; prealar bristle very small; sternopleurals, three, the posterior lower one much below the upper and distinctly in front of it. Abdomen subcylindrical, tapered to apex; first sternite with bristly hairs; fifth sternite with a rather deep posterior excavation, the center of it with a distinct notch. Legs elongate; fore tibia with two minute antero-dorsal setulae, and two strong posterior median bristles; fore tarsus distinctly longer than fore tibia; mid femur with a few long bristles on basal half of postero-ventral surface; mid tibia with one or two antero-dorsal bristles, and a slightly irregular series of four or five on postero-dorsal surface; hind femur with three or four weak bristles on basal half of postero-ventral surface and about six strong bristles on apical half of antero-ventral; hind tibia with from four to six long antero-ventral, three strong antero-dorsal, and, near base, one or two strong postero-dorsal bristles, a number of short setulose hairs on postero-dorsal surface, and some longer setulae on middle of posterior surface. One costal thorn long; outer cross-vein nearly straight; veins three and four distinctly divergent apically. Length, 8 mm.

Type.—♂; Bozeman, Montana, elevation 4800 feet, July 7, 1902, [Illinois].

Helina spinilamellata sp. n.

Male.—Black, densely yellowish gray pruinescent. Head black, frons brownish, parafacials and cheeks slightly velvety; second antennal joint and palpi yellowish. Dorsum of thorax with four narrow fuscous vittae; humeral angles and scutellum yellowish. Abdomen with faintly indicated paired brown dorsal spots, apices of segments yellowish testaceous, that of fourth broadly so. Legs yellowish testaceous, tarsi entirely, fore femora largely fuscous. Cross-veins of wings infuscated. Calyptrae and halteres yellow.

Eyes bare; frons at vertex about one-third as wide as head, wider anteriorly; each orbit with five or six bristles and a few setulose hairs, as is usual in females; ocellar bristles very long; parafacial narrower than third antennal joint and about one-third as wide as height of cheek; arista with its longest hairs not as long as width of third antennal joint; vibrissae very long and strong; proboscis stout. Presutural acrostichals absent; postsutural dorsocentrals, three; prealar minute; hypopleura bare; sternopleurals 1:2. Abdo-

men narrowly ovate; hypopygium small; first sternite bare; fifth deeply cleft, with a group of bristles on a slightly elevated area just caudad of inner extremity of cleft, two or three of the bristles very strong. Fore tibia unarmed; mid tibia with three posterior bristles; hind femur with five or six bristles on apical half of antero-ventral surface; hind tibia with two antero-ventral and two antero-dorsal bristles. Outer cross-vein bent in middle; veins three and four divergent at apices. Length, 5.25 mm.

Type.—♂; Bozeman, Montana, July 17, 1916, [Illinois].

Helina johnsoni sp. n.

Male.—Black, subopaque, covered with dense yellowish pruinescence. Head black, orbits, face, and cheeks with dense silvery pruinescence; second antennal joint brown, its apex and the base of third rufous, remainder of third joint black; palpi brownish black, paler at base. Thorax rather indistinctly quadrivittate. Abdomen with two pairs of faint black dorsal spots. Legs rufous yellow, all coxae grayish, tarsi fuscous. Wings clear, veins yellowish, noticeably so at bases; both cross-veins conspicuously but not broadly infuscated. Calyptrae pale yellow. Halteres yellow.

Eyes with distinct but not dense hairs, separated at narrowest part of frons by a distance about equal to width across posterior ocelli; frons protuberant at base of antennae, where the parafacial is very distinctly wider than third antennal joint; cheek about twice as high as width of parafacial; arista with the longest hairs at least as long as width of third antennal joint. Thorax with four pairs of postsutural dorso-central bristles, and without strong presutural acrostichals; prealar bristle very small; lower anterior sternopleural bristle of moderate length, much longer than in female; hypopleura bare. Abdomen short-ovate; first sternite bare, fifth with a large rounded posterior excavation, the surface bristles of moderate length and slender. Fore tibia with a posterior median bristle; mid tibia with three or four posterior bristles in an irregular series; mid femur with two strong bristles near base on posterior surface; hind femur with about six bristles on apical half of antero-ventral surface, and three or four at apex on postero-ventral; hind tibia with eight or more antero-ventral, two antero-dorsal, and about ten posterior bristles. Costal thorn small; outer cross-vein curved in middle; veins three and four decidedly divergent at apices.

Female.—Similar to the male in color. The head is grayish pruinescent, and the abdomen has rather indistinct dorsal checkerings.

Eyes separated by a little over one-third of the head-width at vertex, and over one-third at base of antennae. Hind tibia with four or five antero-ventral and two antero-dorsal bristles. One costal thorn much longer than in male. Length, 7.5 to 8.5 mm.

Type.—♂; Brookline, Massachusetts, June 18, (C. W. Johnson), [B. S. N. H.]. *Allotype*.—♀; Woodbury, New Jersey, June 7, 1896, (C. W. Johnson). *Paratypes*.—1 ♂, Provincetown, Massachusetts, June 29, 1891; 1 ♀, Auburndale, Massachusetts,

June 16, (C. W. Johnson); 1 ♀, Brookline, Massachusetts, June 28, (C. W. Johnson); 1 ♀, Lyme, Connecticut, May 29, 1910, (A. Champlain); 2 females, Delaware Water Gap, New Jersey, July 11 and 12; 1 ♀, Riverton, New Jersey, June 22, (C. W. Johnson).

Three paratypes are in the collection of Boston Society of Natural History, two in the collection of Illinois Natural History Survey, and one in the collection of The American Entomological Society.

Helina mimetica sp. n.

Female.—Differs from *johnsoni* in having the antennae entirely black, and the cross-veins of the wings broadly infuscated.

Structurally there is no striking difference between this species and *johnsoni*. The lower anterior sternopleural bristle is stronger in the three specimens before me than in *johnsoni*, and the bristles on the tibiae are comparatively stronger. Length, 8.5 to 9 mm.

Type.—♀; Glen House, New Hampshire, June 13, 1916, [B. S. N. H.]. *Paratypes.*—Females; Glen House, New Hampshire, June 14, 1916; North Adams, Massachusetts, June 18, 1906. All taken by C. W. Johnson.

Specimens divided between the three collections mentioned under the preceding species.

Helina bispinosa sp. n.

Male.—Black, densely gray pruinescent. Thorax with three or five black dorsal vittae. Abdomen usually with four black dorsal spots. Legs black, apices of all femora and at least the mid and hind tibiae reddish yellow. Wings clear. Calyptrae white. Halteres yellow.

Eyes bare, separated by width across posterior ocelli, orbits narrow; longest hairs on arista longer than width of third antennal joint; parafacial in profile nearly as wide as third antennal joint, cheek about one-fifth as high as eye. Presutural acrostichals absent; postsutural dorso-centrals four; prealar bristle minute or absent; sternopleurals 2:2. Abdomen subcylindrical, hypopygium protuberant, not very large; fifth sternite with a very conspicuous bristle on each side near base of cleft, and several other bristles near apex of each process. Fore tibia with one posterior bristle; mid femur without antero-ventral bristles; mid tibia with one or two antero-dorsal, two postero-dorsal, one or two postero-ventral bristles; hind femur with six or seven bristles on antero-ventral, and two at middle on postero-ventral surface; hind tibia with one or two antero-ventral and three antero-dorsal bristles, the postero-dorsal surface with a weak bristle basad of middle. Costal thorn long. Length, 6 mm.

Type.—♂; Waukegan, Illinois, August 24, 1917, (J. R. Malloch), [Illinois]. *Paratypes.*—Males; Sidney, Montana, June 13,

1913; Bozeman, Montana, August 3, 1916; Laurel, Montana, July 15.

The Bozeman specimen is deposited in the collection of The American Entomological Society.

Helina nigribasis sp. n.

Male.—Black, subopaque, densely gray pruinescent. Head with dense silvery pruinescence on orbits, face and cheeks; antennae and palpi black. Thorax with four black dorsal vittae. Abdomen with base of first tergite black, the other tergites each with a pair of black spots, those on fourth sometimes indistinct. Legs black, apices of all femora and all of tibiae reddish testaceous. Wings slightly brownish; cross-veins very slightly infuscated. Calyptrae white. Halteres yellow.

Eyes almost nude, separated at narrowest part of frons by a distance about equal to width across posterior ocelli; interfrontalia almost obliterated just in front of ocelli; orbits bristled over midway to anterior ocellus; parafacial in profile nearly as wide as third antennal joint, narrowed below; cheek one-fourth as high as eye; longest hairs on arista nearly as long as width of third antennal joint. Presutural acrostichal bristles absent or very small; prealar minute or absent; three pairs of postsutural; dorso-centrals present; sternopleurals 2:2, the lower anterior one weak; hypopleura bare; scutellum without ventral or lateral hairs. Abdomen subcylindrical; basal sternite bare; fifth sternite with a deep central cleft, the surface with a number of stout, moderately long bristles on each side of cleft. Fore tibia with or without a weak median posterior bristle; mid and hind femora each with a few long bristles on basal half of postero-ventral surface, the latter with a complete series on antero-ventral surface; mid tibia with three or four posterior bristles; hind tibia with one or two antero-ventral, three or four antero-dorsal, and three or four postero-dorsal bristles, all short. Third vein bare at base; veins three and four divergent at apices.

Female.—Differs from the male in having the basal abdominal tergite usually with a pair of dark spots, and the mid and hind femora with their apices broadly rufous.

Frons over one-third of the head-width at vertex, slightly wider anteriorly. Fore tibia usually with one or two posterior bristles; mid tibia with an antero-dorsal bristle at or near middle. In other respects as male. Length, 5.5 to 6.5 mm.

Type.—♂; Dongola Illinois, May 12, 1917. *Allotype.*—♀; topotypical. *Paratypes.*—Dongola, Illinois, May 9, 10 and 12, 1917, and May 12, 1916; Dubois, Illinois, May 24, 1917; Carlinville, Illinois, May 18, (C. Robertson). Thirty-nine specimens.

Type and paratypes in collection of Illinois Natural History Survey, paratypes also are deposited in the collection of The American Entomological Society.

The Dongola and Dubois specimens were taken by Mr. C. A. Hart and the writer, mostly from the leaves and stems of trees.

Helina consimilata sp. n.

Male.—Similar in color to *nigribasis*. Second antennal joint brown.

Differs from the preceding species in having the arista rather shorter haired, fore tibia with two slender bristles on posterior surface beyond middle, hind femur with long hairs on entire length of postero-ventral and ventral surfaces, hind tibia with about eight long slender bristles on antero-ventral surface, one or two antero-dorsal, and two or three postero-dorsal bristles, and the postero-ventral and ventral surfaces with moderately long erect hairs, except basally. Length, 5.5 mm.

Type.—♂; New Bedford, Massachusetts, (Hough), [Illinois].

Helina spuria sp. n.

Male and *female.*—Very similar to *nigribasis* in color and structure. Differs in both sexes in having the second antennal joint reddish, the crossveins more distinctly infuscated, the abdominal spots larger, and in the male the abdomen with a rather indistinct dorso-central vitta.

Structurally as *nigribasis*, but the arista with slightly shorter hairs, the lower anterior sternopleural bristle absent, the hind femur has shorter and fewer bristles on the postero-ventral surface, these consisting of two or three short bristles near middle.

The female has the mid and hind femora entirely pale, with a few setulose hairs on the postero-ventral surface of the hind pair.

Length, 6 mm.

Type.—♂; San Luis Obispo, California, April 24, 1919, (E. P. Van Duzee), [California Academy of Sciences]. *Allotype.*—♀; topotypical.

XENOMYDAEA gen. n.

This genus differs from *Aricia* in having the third vein with a few setulae at base, and from *Mydaea* in having the head buccate, very distinctly produced at base of antennae and at vibrissal angle as in figure 29, and the last ventral abdominal segment without strong spines.

Genotype.—*Xenomydaea buccata* sp. n.

Xenomydaea buccata sp. n.

Male and *female.*—Black, slightly shining, densely brownish gray pruinescent. Head black, frons, face, parafacials and cheeks with silvery pruinescence; antennae and palpi black. Thorax with four fuscous vittae. Abdomen with a very indistinct pair of elongate fuscous spots on each tergite in male, immaculate in female. Legs reddish yellow, femora more or less infuscated, the fore pair usually largely so in both sexes. Wings clear. Calyptrae and halteres yellow.

Male.—Eyes bare; frons at narrowest part about one-sixth as wide as head; parafacial broad, at its narrowest part distinctly wider than third antennal joint, broader at base of antennae and vibrissal angle, the profile concave, vibrissal angle in line with lower margin of eye; cheek nearly twice as high as width of parafacial, its lower margin with a series of bristles and above these some setulose hairs, one of which at anterior end of series is upcurved (fig. 29); longest hairs on arista not longer than its basal diameter. Presutural acrostichals absent; postsutural dorso-ventrals three; prealar bristle about one-third as long as the one behind it; hypopleura bare; sternopleurals 2:2. Abdomen narrowly ovate; hypopygium small; basal sternite bare; fifth with a broad posterior excision, its surface with numerous strong bristles. Fore tibia unarmed at middle; mid femur with an almost complete series of postero-ventral bristles; mid tibia with three or four posterior bristles; hind femur with a complete series of bristles on both antero- and postero-ventral surfaces; hind tibia with two to four antero-ventral and two antero-dorsal bristles, the posterior and postero-dorsal surfaces on their apical half with some short setulae. Third vein with a few setulae at base; veins three and four divergent at apices.

Female.—Differs from the male in having the frons over one-third of the head-width, and the postero-ventral surface of the hind femur without bristles.

Length, 7.5 to 8.5 mm.

Type.—♂; Monida, Montana, June 27, 1913, [Illinois]. *Allotype.*—♀; Tennessee Pass, Colorado, July 24, 1917.

EULIMNOPHORA gen. n.

Differs from *Limnophora* in having the basal abdominal sternite with a few setulose hairs, and the prosternum and base of third wing-vein bare.

Genotype.—*Limnophora arcuata* Stein.

Eulimnophora cilifera sp. n.

Male and *female.*—Black, densely gray pruinescent. Thorax with three rather poorly defined brown vittae. Abdomen of male with basal dorsal segment, except its posterior margin, black, segments two and three each with a pair of large subtriangular black spots; abdomen of female less distinctly marked than that of male, the spots less clearly defined; the larger bristles with their bases surrounded by blackish dots. Legs black, the knees more or less reddish. Wings clear. Calyptrae white. Halteres yellow.

Male.—Eyes separated at narrowest part of frons by about the width of anterior ocellus; third antennal joint rounded at apex, its length over twice that of second; arista with very short pubescence; parafacial in profile almost linear; cheek about as high as width of third antennal joint. Thorax with the presutural hairs four-rowed; four pairs of postsutural dorso-centrals present. Abdomen subovate; basal sternite with a number of hairs on each side; fifth sternite glossy black, with numerous long hairs round margin of

posterior excavation, the basal portion of surface bare. Mid femur with a number of weak bristles on basal half of antero-ventral surface and a series of longer bristles from base to well beyond middle on postero-ventral; mid tibia with one median posterior bristle; hind femur with a rather closely placed series of very short erect bristles from base to apex, the apical two or three much longer than the others; hind tibia with one antero-dorsal and one antero-ventral bristle, the latter usually a little apicad of the former; apical antero-dorsal bristle absent. Wing rather acute at apex, third vein ending in tip, fourth usually slightly curved forward, its apex very noticeably proximad of apex of third.

Female.—Similar to male in chaetotaxy of thorax and bristling of legs. The frons is about one-third as wide as head at vertex, slightly widened anteriorly, with the frontal triangle not extending much beyond middle; the orbits are narrow, each with five or six bristles and a few short hairs.

Length, 3 to 3.75 mm.

Type.—♂; Waukegan, Illinois, August 24, 1917, (J. R. Malloch), [Illinois]. *Allotype.*—♀; Algonquin, Illinois, October 2, 1895, (W. A. Nason). *Paratypes.*—1 ♂, Urbana, Illinois, October 22, 1916, in forestry of the University of Illinois; 2 males Waukegan, Illinois, August 24, 1917; 2 males, without data; 1 ♀, Algonquin, Illinois, September 3, 1894, (W. A. Nason); 1 ♀, Swarthmore, Pennsylvania, October 24, 1910.

The type was taken on the shore of Lake Michigan, but evidently the species is not confined to the vicinity of large bodies of water, as the Urbana specimen was taken a mile or more from the nearest moderately clean body of water.

Eulimnophora dorsovittata sp. n.

Female.—Similar in color to the preceding species, except that the palpi are largely yellowish basally, the apices of femora are more broadly pale and the tibiae more extensively yellowish. The thorax has seven brown vittae, the median one prolonged to apex of scutellum, the submedian pair almost complete, and the lateral two on each side much shorter.

Structurally similar to *arcuata* Stein, the frontal triangle is very long and narrow, conspicuously attenuate just in front of anterior ocellus; the anterior intra-alar bristle is not distinguishable from the discal setulae in type; and the hind femur has only two antero-ventral bristles, near apex. Length, 5.5 mm.

Type.—♀; Kingston, Jamaica, West Indies, April, 1891, (C. W. Johnson), [Illinois].

LISPOIDES gen. n.

This genus is distinguished from its allies by having the hairs continued down on parafacials below level of apex of second antennal joint. The eyes are separated by about the same distance in both sexes.

Genotype.—*Limnophora acquifrons* Stein.

Lispoides acquifrons Stein

1897. *Limnophora acquifrons* Stein, Berl. Ent. Zeitschr., xlii, p. 205.

One male; Swarthmore, Pennsylvania, June 3, 1905.

I have seen this species also from Illinois, New Jersey, and California.

Limnophora groenlandica sp. n.

Female.—Black, covered with dense grayish pruinescence. Frontal triangle brown, opaque; interfrontalia brownish black, opaque; orbits, face, and cheeks white pruinose. Dorsum of thorax with a brown suffusion on greater portion of disc, without clearly defined vittae. Abdomen shining, segments one, two and three each with a large poorly defined subtriangular brown spot on each side on dorsum. Calyptrae white. Halteres yellow.

Structurally similar to *discreta* Stein, differing as follows: Frontal triangle shorter and broader; arista shorter, the basal swelling more elongate, and the pubescence much shorter; parafacial in profile broader, at least as wide as third antennal joint; cheeks with more numerous short hairs; mid tibia with an antero-dorsal bristle; hind tibia with a weak antero-dorsal bristle apicad of the strong one. Length, 4 mm.

Type.—♀; West Coast of Greenland, 1891, (Mengel and Hughes, on the Peary Expedition), [A. N. S. P., Type no. 6231].

Limnophora velutina n. n.

1913. *Parlimnophora brunneisquama* Malloch [nec Strobl], Proc. U. S. Nat. Mus., xlv, p. 605.

This species was originally placed in a genus which I considered distinct from *Limnophora*, and which is distinct from my present concept of that genus, but there is another species which does not belong to the genus *Limnophora* in the restricted sense, which has the same specific name, and it thus appears necessary to change the name of the American one as above.

The species occurs in the northeastern states and in Newfoundland.

The apex of the hind tibia and hypopygial forceps and fifth sternite are represented in figures 12, 21 and 22.

Limnophora acuticornis sp. n.

Male.—Black, faintly shining, covered with dense gray pruinescence. Head entirely black, frons, face and cheeks with dense silvery pruinescence. Thorax with a distinct narrow central vitta and a broader less distinct one on each side of it. Abdomen with a narrow fuscous or dark brown dorsocentral interrupted vitta, basal segment (second) indistinctly brownish on dorsum, the next two segments each with a large subtriangular brownish-

black spot on each side of dorsum. Legs black. Wings slightly grayish. Calyptrae white. Halteres yellow.

Frons at vertex nearly one-third as wide as head, slightly narrowed at center, where it is over twice as wide as the distance across posterior ocelli; orbits almost linear, each with four to five bristles and a few weak hairs, the bristles all incurved; face slightly convex in profile, the frons, at base of antennae, produced a little further than vertical line of vibrissal angle; antennae elongate, the third joint acutely pointed at apex on upper side; arista with the longest hairs about equal in length to basal diameter of arista; parafacial in profile broader than third antennal joint, its width equal to two-thirds the height of cheek, the latter about one-fifth as high as eye, its margin with a series of moderately strong bristles and above these a few weak hairs, the hairs above vibrissa few and weak. Thorax with three pairs of postsutural dorso-central bristles; presutural acrostichals two-rowed just in front of suture; preapical scutellars absent; sternopleurals 1:2. Fore tibia unarmed at middle; mid tibia with one antero-dorsal and two postero-dorsal bristles; hind femur with a series of rather long hair-like bristles on basal half of postero-ventral surface, the antero-ventral surface with three to five strong bristles on apical half; hind tibia with two antero-dorsal and two antero-ventral bristles, and one or two weak postero-dorsal setulae. Third vein bare at base; veins three and four subparallel apically; apex of wing almost midway between veins three and four.

Female.— Differs from the male in being darker colored, with the frons less distinctly pruinescent, and the abdominal markings less distinct.

The frons is slightly over one-third of the head-width, and the orbital hairs are more numerous than in the male. The body is ovate and the genitalia without curved apical thorns.

Length, male, 5 mm.; female, 5 to 6 mm.

Type.—♂; Swarthmore, Pennsylvania, August, 1908, [A. N. S. P., Type no. 6225]. *Allotype.*—♀; Swarthmore, Pennsylvania, June 26, 1910, along shady creek, (E. T. Cresson, Jr.). *Paratypes.*—2 females; Swarthmore, Pennsylvania, July, 1908; Jack Run, Allegheny, Pennsylvania, June 14, 1908.

The widely separated eyes of the male, and the acute angle of third antennal joint will separate this species readily from any so far described from North America.

Limnophora brevicornis Malloch

1917. *Tetramerinx brevicornis* Malloch, Can. Ent., L, p. 226. (Female.)

I had only females of this species at the time when I wrote the specific description, and, as that sex of the species agrees very closely with those of the genotype of *Tetramerinx*, I erroneously placed it in that genus.

The male differs from typical species placed in *Limnophora* less conspicuously than does *acquifrons* Stein or *arcuata* Stein, and until it is possible for some one to revise the group thoroughly I consider it advisable to leave the species in *Limnophora*, the more so as I do not clearly understand the subdivisions of the genus proposed by recent European authors.

I append a brief description of the male of *brevicornis*.

Male.—Color as in female, grayish white, basal dorsal segment of abdomen black on a large portion of disc, second segment with a pair of large subtriangular black spots, third segment with a pair of small blackish spots which are at times indistinct. Orbits, face and cheeks silvery.

Eyes separated by a little more than width across posterior ocelli, orbits almost or quite obliterating interfrontalia, each with five or six bristles along inner margin, otherwise bare. Acrostichals two-rowed. Hind femur with long slender bristles on basal half of posterior surface, postero-ventral surface bare. Otherwise as female. Length, 4 mm.

Allotype.—♂; Waukegan, Illinois, August 24, 1917, (J. R. Malloch), [Illinois]. Three other specimens with same data.

The species occurred on the bare sand on the shore of Lake Michigan.

Limnophora argentiventris sp. n.

Male.—Differs from the preceding species in having the ocellar triangle black and the abdomen silvery, with smaller black dorsal spots.

Structurally similar to *brevicornis*, but cheek slightly higher than width of parafrontal at base of antennae. In addition to the elongated fourth tergite this species differs from *brevicornis* in having the basal portion of hypopygium with a long bristle on each side close to central cleft, all sternites with more numerous hairs, the fifth distinctly produced at apex of each process, and the hind femur with a few slender bristles at base on postero-ventral surface and without the posterior bristles. Length, 3.5 mm.

Type.—♂; Gallatin County, Montana, August 23, 1917, [Mont. Exp. Sta.].

Limnophora obsoleta sp. n.

Male.—Black, subopaque, the abdomen slightly shining. Orbits, face and cheeks with silvery gray pruinescence. Thorax with slight gray pruinescence, which is most distinct on lateral margins and on the narrow vittae on each side of the median line on disc. Abdomen almost entirely black, the posterior margins of the tergites brownish, the dorsal spots indistinguishable. Legs entirely black. Wings slightly and evenly browned, veins thick, dark brown. Calyptrae obscurely yellowish. Halteres pale brown.

Eyes bare, separated at narrowest part of frons by a distance about 1.5 as great as width across posterior ocelli, the interfrontalia as wide as one

orbit, the latter with long bristly hairs on their entire length; parafacial in profile at base of antenna a little wider than third antennal joint, narrowed below; vibrissal angle with its anterior extremity in line with base of antennae, the face a little concave; third antennal joint subequal in length to second; arista bare, much thickened on a little less than its basal third; cheek about one-fourth as high as eye (fig. 30). Thorax with numerous long hairs, the dorso-centrals weak, four pairs behind suture. Abdomen elongate, almost cylindrical; hypopygium small. Fore tibia unarmed at middle; mid femur with a few bristles on basal half of postero-ventral surface; mid tibia with or without one or more antero-dorsal bristles, with one or two postero-dorsal and postero-ventral bristles; hind femur with a series of bristles on antero-ventral surface, which are weak basally, and a few bristles on basal half of postero-ventral; hind tibia with a variable number of weak bristles, usually from one to three on antero-ventral and antero-dorsal surfaces, and sometimes with a few setulae on postero-dorsal surface; hind tarsus distinctly longer than tibia. Costal setulae longer than diameter of costal vein on basal half of wing; veins three and four subparallel. Calyptrae small, the lower one not very much larger than the upper.

Female.—Similar in general color to the male, but more brownish and the thoracic dorsum with four more distinct vittae.

Eyes separated by more than one-third of the head-width; orbits wide, each over half as wide as interfrontalia, with numerous bristly hairs laterad of the bristles. Abdomen ovate; genitalia without thorns. Costal setulae longer than in male. Length, 4 to 5 mm.

Type.—♂; West Coast of Greenland, 1891, (Mengel and Hughes, on the Peary Expedition), [A. N. S. P., Type no. 6226]. *Allotype* and *paratypes.*—Nine specimens, topotypical.

Limnophora extensa sp. n.

Male.—Differs from *obsoleta* in having the pruinescence gray, the abdomen with large paired dorsal black spots, and the calyptrae white.

Profile as in figure 32. Eyes separated by less than width between posterior ocelli. Thoracic chaetotaxy as in *obsoleta*, the surface hairs longer. Abdomen broader than in *obsoleta*, the hypopygium and fifth sternite as in figures 23 and 24. Legs with stronger bristles than in *obsoleta*, fore tibia with a few long bristly hairs on posterior surface; mid tibia with two antero- and postero-dorsal bristles; hind femur with a series of antero-ventral bristles and a few short bristly hairs on basal half of postero-ventral surface; hind tibia with two antero-ventral, two or three antero-dorsal and two or three postero-dorsal bristles. Costal setulae short but distinct; fourth vein curved downward at apex. Lower calyptra much larger than upper.

Female.—Differs from the female of *obsoleta* in having the vibrissal angle much produced, the costal setulae short, and the lower calyptra much longer than the upper.

Length, 5 to 6 mm.

Type.—♂; West Coast of Greenland, 1891, (Mengel and Hughes, on the Peary Expedition), [A. N. S. P., Type no. 6227]. *Allotype* and *paratypes.*—Eight specimens, topotypical.

Limnophora angulata sp. n.

Male.—Color as in *extensa*.

Differs from *extensa* in being larger, in having the hairs on body and legs longer, the bristles on mid and hind femora longer and more numerous, the hypopygium larger (fig. 25), and the incision in fifth sternite deeper (fig. 26).

Female.—Larger than the female of *extensa*, with the vibrissal angle less produced (fig. 38), and the mid and hind femora more conspicuously bristled.

Length, 6 to 7.5 mm.

Type.—♂; West Coast of Greenland, 1891, (Mengel and Hughes, on the Peary Expedition), [A. N. S. P., Type no. 6228]. *Allotype* and *paratypes.*—Three specimens, topotypical.

Limnophora pearyi sp. n.

Male.—Similar to *extensa* in color, the wings darker and the spots on abdomen more distinctly separated in middle.

Eyes separated by width across posterior ocelli; vibrissal angle less produced than in *extensa* (fig. 35). Abdomen cylindrical, incision in fifth sternite wedge-shaped. Armature of legs as in *extensa*, but the hind femur has the antero-ventral bristles confined to apical half and the postero-ventral surface with very few weak bristly hairs on basal third.

Female.—Similar to the female of *extensa*, but the vibrissal angle less produced, and the hind femur as in male, except that the postero-ventral surface is bare.

Length, 4.5 to 5.5 mm.

Type.—♂; West Coast of Greenland, 1891, (Mengel and Hughes, on the Peary Expedition), [A. N. S. P., Type no. 6229]. *Allotype* and *paratype.*—Two specimens, topotypical.

Limnophora novae-angliae sp. n.

Male.—Deep black, shining. Dorsum of thorax slightly gray pruinescent, that of abdomen, except on the spots, densely so. Basal tergite entirely black, second with two very large subquadrate black spots, third with a pair of smaller subtriangular spots, both pairs narrowly separated, fourth with a poorly-defined central spot. Wings grayish, slightly infuscated at bases and on cross-veins. Calyptrae and halteres yellow.

Eyes separated by twice the width across posterior ocelli; orbits linear; parafacials nearly as wide as third antennal joint; cheek about three times as high as width of parafacial; setulae continued about one-third of the way from vibrissa to base of antenna; third antennal joint angulated at apex

above; arista almost bare. Thorax with four pairs of postsutural dorsocentrals. Abdomen narrowly ovate; fifth sternite with a deep wedge-shaped posterior incision, which is transverse at base, the surface with numerous small setulae adjacent to basal half of incision, and a few long bristly hairs apically. Fore tarsus much longer than tibia; mid femur with some long bristles on basal half of postero-ventral surface; mid tibia without antero-dorsal bristles; hind femur with a series of bristles on antero-ventral surface, those on apical half strong, and long bristly hairs on basal half of postero-ventral surface; hind tibia with two or three antero-ventral, three or more antero-dorsal, and two or three postero-dorsal bristles, the latter short.

Female.—Much paler than male, the thorax with three indistinct brown vittae, the abdominal spots brown.

Eyes separated by one-third of the head-width, frons widened anteriorly. In other respects as male.

Length, 6 mm.

Type.—♂; Mt. Washington, New Hampshire, 4000 feet, July 4, (C. W. Johnson), [B. S. N. H.]. *Allotype.*—♀; Base Station, Mt. Washington, New Hampshire, August 14, 1916, (C. W. Johnson). *Paratypes.*—♂ and ♀; Nain, Labrador, August 18.

Limnophora monticola sp. n.

Male.—Similar to the preceding in color, the wings brownish along veins.

Differs from *novae-angliae* in having the eyes separated by width across posterior ocelli, the incision in fifth sternite not so deep and the hind femur with only three or four strong antero-ventral bristles on apical third, the remainder of that surface unarmed, and the postero-ventral surface without long bristly hairs on basal half. Length, 6 mm.

Type.—♂; Mt. Washington, New Hampshire, July 8, 1914, (C. W. Johnson), [B. S. N. H.].

Limnophora gibsoni sp. n.

Male.—Similar to *monticola* in color, the wings conspicuously infuscated, especially basally.

Eyes separated by less than width across posterior ocelli; hind femur with more numerous bristles on antero-ventral surface, and with some short setulae on middle of postero-ventral surface; inner cross-vein a little before apex of first vein, the penultimate section of fourth vein nearly half as long as ultimate; in *monticola* the inner cross-vein is just beyond apex of first, and the penultimate section of fourth is one-third or a little over one-third as long as ultimate. Length, 6.5 mm.

Type.—♂; Youghall, New Brunswick, Canada, July 3, 1908, (A. Gibson), [Can. Nat. Coll.].

Limnophora tetrachaeta sp. n.

Male.—Shining black. Thorax with faint pruinescence. Abdomen with dense brownish gray pruinescence, a fine dorso-central black vitta between the black paired spots. Wings slightly grayish. Calyptrae obscurely yellow. Halteres black.

Eyes separated by almost twice the width across posterior ocelli; orbits narrow, strongly bristled nearly to anterior ocellus; parafacial not as wide as third antennal joint, slightly narrowed below; cheek about twice as high as width of parafacial; setulae continued above vibrissae about one-third of the way to base of antennae; arista pubescent. Presutural acrostichals strong, irregularly two-rowed; postsutural dorso-centrals four. Abdomen narrowly ovate, thick; fifth sternite and hypopygium as in figures 19 and 20. Legs stout; fore tarsus longer than tibia, the latter with a median posterior bristle; mid femur with a number of short bristles on basal half of antero-ventral surface and some longer bristles on basal half of postero-ventral; mid tibia with at least one antero-dorsal bristle, the postero-dorsal and posterior surfaces with one or two bristles each; hind femur with a complete series of antero-ventral bristles, and some shorter bristles on basal half of postero-ventral; hind tibia with two antero-ventral, two antero-dorsal and two or three postero-dorsal bristles, the latter very short. Length, 5 mm.

Type.—♂; Blitzen River, Oregon, July 6, 1906, [Illinois]. *Paratypes.*—1 ♂, topotypical; 1 ♂, Bozeman, Montana, July 23, 1915.

There is a female specimen in my material which appears to belong to this species. It has the frons one-third of the head-width, each orbit with five strong bristles and a few short setulose hairs, the abdomen shining, without distinct spots, the fore tibia with an antero-dorsal bristle at middle, and the hind femur with three long bristles at base on postero-ventral surface. The costal thorn is much longer than in the male, and the last section of fourth vein is less than twice as long as preceding section, while in the male it is over twice as long. Locality, Mystic Lake, Montana, July 24, 1902.

Limnophora alticola sp. n.

Male.—Differs from *caroli* in having the thorax much deeper black, without distinct markings. The abdomen is similarly marked to that of *caroli*, the space between the dorsal spots being more or less filled in with brownish or fuscous.

Eyes separated by width across posterior ocelli; interfrontalia almost obliterated in front of ocelli; profile almost as in *obsoleta* (fig. 33). Chaetotaxy of thorax and legs as in *caroli*. Incision of fifth sternite not so clearly wedge-shaped as in *caroli*, the base of the incision truncated.

Female.—Differs from the male in having the thorax with three brown vittae.

Eyes separated by a little less than one-third of the head-width at vertex, widened anteriorly. Abdomen broad, tapered posteriorly. Length, 4 to 5 mm.

Type.—♂; Glen House, New Hampshire, August 3, 1914, (C. W. Johnson), [B. S. N. H.]. *Allotype.*—♀; Mt. Washington, New Hampshire, no other data. *Paratypes.*—Mt. Washington, New Hampshire, two males, July 28, 1915, one male, August 16, 1915; Mt. Monadnock, New Hampshire, June 26, 1917; one male, Princeton, Maine, July 12; Nain, Labrador, one male, August 18; Mountains east of Codroy, Newfoundland, three males, one female, July 19 to 22, 1905; Lewisport, Newfoundland, one male, July to August, 1905.

All except the last specimen were sent to me by Mr. C. W. Johnson from the collection of Boston Society of Natural History, the last specimen belongs to the American Museum of Natural History, New York.

Limnophora suspecta sp. n.

Male.—Very similar to *alticola* but much paler in color. Thorax and abdomen densely pale gray pruinescent. Tibiae rufous. Wings yellowish, veins pale, yellow basally.

Structurally similar to *alticola*, the eyes rather more widely separated, and the hind femora less strongly bristled, especially on the postero-ventral surface. Length, 4.5 to 5.5 mm.

Type.—♂; Capens, Maine, August 19, [B. S. N. H.]. *Paratype.*—♂; Mt. Ascutney, Vermont, July 11, 1908. Collected by C. W. Johnson.

Limnophora caroli sp. n.

Male.—Black, subopaque, densely gray pruinescent. Interfrontalia opaque black when viewed from above; orbits, face, and cheeks with white pruinescence. Dorsum of thorax with three brown vittae, the outer one on each side broadened at and beyond suture, all three ceasing before posterior margin; scutellum with a large brown mark on each side of disc. Abdomen with a large subquadrate black dorsal spot on basal segment, which is paler centrally, a pair of large black spots on second and third segments, each pair connected centrally by a brown spot, and a brown spot in center of fourth segment. Legs pitchy black. Wings slightly brownish. Calyptrae white. Halteres yellow.

Eyes separated by almost one-third of the head-width; frons a little widened anteriorly; each orbit about one-fourth as wide as interfrontalia, with six

or seven bristles, laterad of which there are some hairs in a vertical series; frons slightly buccate, width of parafacial at base of antennae about equal to that of third antennal joint, much narrowed below; a few setulae above vibrissa. Acrostichals in about four irregular rows; postsuturals three; sternopleurals 1:2. Abdomen subovate; fifth sternite with a deep V-shaped notch. Legs slender; hind tarsi longer than tibia; fore tibia with or without median bristle; mid tibia with one or two antero-dorsal and postero-dorsal bristles; hind femur with a few slender posterior bristles on basal half, and four or five bristles on apical half of antero-ventral surface. Veins three and four subparallel apically, the former ending close to wing tip, the latter much behind it. Length, 4.75 mm.

Type.—♂; Mt. Ascutney, Vermont, July 11, 1908, (C. W. Johnson), [B. S. N. H.]. One specimen.

The peculiar abdominal markings and very widely separated eyes serve to separate this species from any known to me from this country or Europe.

Named in honor of the collector of the type.

Limnophora clivicola sp. n.

Male.—Black, slightly shining, the surface with dense gray pruinescence. Head entirely black, orbits, face, and cheeks with white, almost silvery pruinescence. Anterior half of thoracic dorsum shining brownish black, the sides and posterior half gray pruinescent. Abdomen with basal half of first visible tergite, a pair of elongate poorly defined spots on next two tergites and a central spot on apical tergite, black, the second and third segments each with a very faintly indicated central vitta between the spots in most specimens. Legs black. Wings clear, slightly brownish apically; veins pale at bases. Calyptrae and halteres yellowish.

Eyes almost bare, separated by about as great a distance as width across posterior ocelli; interfrontalia almost obliterated at middle; antennae extending about two-thirds of the distance to mouth-margin; arista with its longest hairs a little longer than its basal diameter; parafacial in profile linear; cheek a little higher than width of third antennal joint, with moderately long bristles along lower margin; a few short bristles above vibrissa (fig. 36). Presutural acrostichals weak, four-rowed; postsutural dorso-centrals, three; prealar absent; lower posterior sternopleural very weak. Fore tibia unarmed at middle and without apical posterior bristle; mid femur with a few bristles on basal half of postero-ventral surface; mid tibia with or without a weak antero-dorsal bristle, the postero-dorsal surface with two or three bristles; hind femur with five or six bristles on apical half of antero-ventral surface, the basal half of posterior surface with setulose hairs, postero-ventral surface bare; hind tibia with two antero-ventral and two antero-dorsal bristles, apical antero-dorsal bristle weak; mid and hind tibiae longer than their tibiae; pulvilli slightly longer than claws. Outer cross-vein slightly curved, inner proximad of apex of first vein; veins three and four divergent apically; costal thorn very small.

Female.—Differs from the male in color in having the thorax with a broad brownish black vitta on each side of dorsum, which does not extend beyond middle posteriorly, and usually also a narrow central vitta; abdomen with five blackish spots as in male, the other markings absent.

Frons at vertex less than one-third of the head-width, much wider anteriorly; orbits narrow, with a few hairs laterad of the bristles; ocellar triangle narrow, poorly defined, shining in part, not extending to anterior margin. Bristles on tibiae rather variable in number, the fore tibia sometimes unarmed at middle and sometimes with one or two bristles on posterior surface.

Length, 6 to 7 mm.

Type.—♂; Makanda, Illinois, June 4, 1919, [Illinois]. *Allotype.*—♀; topotypical. *Paratypes.*—Two males, Makanda, Illinois, June 5, 1919; one male, one female, Alto Pass, Illinois, June 6, 1919; one male, Chester, Massachusetts, August 5, 1911; one female, Cornish, New Hampshire, July 13 (C. W. Johnson). The Illinois specimens were taken by the writer and C. P. Alexander.

This species in Illinois was found at rest on vertical rock surfaces.

Related to *torreyae* Johannsen, from which it readily may be separated by the form of the head in both sexes, the profile differing as shown in figures 36 and 39 in the males, the frons in females of *torreyae* being entirely opaque.

Trichopticus coquilletti sp. n.

Male.—Black, shining, the dorsum of abdomen with drab-gray pruinescence except on a narrow central vitta. Wings slightly browned. Calyptrae yellow. Knobs of halteres black.

Eyes with dense long hairs; frons about as wide as anterior ocellus; arista pubescent. Thorax without presutural acrostichals; postsutural dorsocentrals, four pairs; prealar not developed. Abdomen cylindrical, slightly tapered apically. Apical joint of fore tarsus more distinctly laterally compressed than in *hirsutu'a*, the dorsal ridge higher; preapical joint with two or three strong bristles at apex; mid femur with a series of bristles on basal half of postero-ventral surface, which are directed apicad and lie rather close to surface, the last bristle in series much stronger than the others; mid tarsus broadened apically, the fourth joint broader than long; mid tibia with three or four posterior bristles; hind femur with soft, erect hairs on posterior surface, and a series of bristles on apical half of antero-ventral surface; hind tibia slightly curved, with a long, stout, blunt spur consisting of three or four closely fused bristles at apex of ventral surface, antero-dorsal and antero-ventral surfaces with erect fine hairs, the length of which does not exceed diameter of tibia, postero-dorsal surface with a long bristle about one-fourth from apex, preapical dorsal bristle short. Venation normal. Length, 6.5 mm.

Type.—♂; Popoff Island, Alaska, July 13, 1899, (Kincaid), [U. S. N. M.].

This is the species recorded by Coquillett as *Lasiops hirsutula* Zetterstedt, in the report on the Diptera collected by the Harriman Alaska Expedition.[1]

From *coquilletti*, *hirsutula* differs in having the prealar bristle long; mid femur with a series of short stout spines on basal half of ventral surface instead of very weak hairs; the hind tibia with two or three postero-dorsal bristles, the antero-ventral hairs much longer than the diameter of the tibia and the posterior surface with long hairs, and the fourth joint of mid tarsus much longer than broad.

Trichopticus conformis sp. n.

Male.—Black, slightly shining, thorax and abdomen with dense golden brown pruinescence, the former with two narrow submedian, and two broad sublateral black vittae, the abdomen with a narrow black dorso-central vitta, which is slightly dilated at apex of each segment. Antennae and palpi black. Legs yellow testaceous, the coxae, trochanters, fore femora and tarsi infuscated. Wings hyaline, yellow at bases. Calyptrae and halteres yellow.

Eyes hairy, separated by about width of anterior ocellus; parafacials about half as wide as third antennal joint and half as wide as height of cheek; antennae elongate, extending almost to mouth-margin, third joint twice as long as second; arista with longest hairs not longer than its basal diameter. Thorax with two strong pairs of presutural acrostichals and four pairs of postsutural dorso-centrals; prealar bristle more than half as long as the one behind it. Abdomen broadly ovate; hypopygium as in figures 9 and 10; fifth sternite with rather dense setulose hairs on disc, the posterior margin with a broad, shallow, rounded emargination (fig. 11). Fore tibia with from one to three posterior bristles; fore tarsus normal, longer than tibia; mid femur normal in shape; mid tibia with one or two antero-dorsal, two or three postero-dorsal and two or three postero-ventral bristles; hind femur with a series of bristles from base to apex, which increase in length to near apex and then decrease; the ventral surface with numerous erect short hairs; hind tibia with from five to eight antero-ventral setulae, the anterior and antero-dorsal surfaces with erect short hairs, among which, on the latter surface, are two or three longer bristles, the postero-dorsal surface with a long median bristle, and a few erect hairs on the posterior surface. Costal thorn minute; outer cross-vein slightly curved.

Female.—Similar in color to male.

Eyes separated by one-third of the head-width; interfrontalia without cruciate bristles; lower, forwardly directed, supraorbital bristle much longer and stronger than second. Armature of fore and mid tibia as in male; hind

[1] Proc. Wash. Acad. Sci., ii, p. 444.

femur with four or five strong bristles on apical half of antero-ventral surface; hind tibia with one postero-dorsal, two or three antero-dorsal and two or three antero-ventral bristles. Wings more rounded than in male; outer cross-vein nearly straight.

Length, 7 to 7.5 mm.

Type.—♂; Mt. St. Piran, Alberta, Canada, no date, (H. Skinner), [A. N. S. P.]. *Allotype.*—♀; Base Station, Mt. Washington, New Hampshire, August 15, 1916, (C. W. Johnson). *Paratypes.*—Boisdale, Cape Breton, Nova Scotia, July 18 to 19, one male; Spruce Brook, Newfoundland, August 8 to 12, two males; Youghall, New Brunswick, Canada, July 4 to 7, 1908, (A. Gibson), four males and two females; Mt. Washington, New Hampshire, one male; White Mountains, New Hampshire, (Scudder), one female; Fallen Leaf, Lake Tahoe, California, June 15, 1916, (H. G. Dyar), one male; Kokanee Mt., British Columbia, August 10, 1903, (H. G. Dyar), one female; South Fork Creek, British Columbia, August 11, 1903, (H. G. Dyar), one male; Lillooet, British Columbia, September 6, 1918, one male.

Trichopticus latipennis sp. n.

Male and *female.*—Similar in general color to the preceding species. Fore femora entirely pale, base of third antennal joint and apex of second narrowly reddish, thorax and abdomen more distinctly shining than in *c nformis* and with grayish instead of brassy yellow pruinescence.

Male.—Head as in *conformis* but the cheek has fewer and stronger marginal bristles. Thorax with two pairs of very weak presutural acrostichals. Abdomen more elongate than in *conformis,* and less pointed at apex. Fore tibia unarmed at middle; mid femur with a few strong bristles on basal half of antero-ventral surface and some weak hairs on basal half of postero-ventral; mid tibia with two or three posterior bristles and a few weak postero-ventral setulae; hind femur with a series of bristles on antero-ventral surface which are shortest in middle, and a few bristles on apical third of postero-ventral surface; hind tibia with one postero-dorsal and two antero-dorsal bristles, the antero- and postero-ventral surfaces with long bristly hairs, which are longest at middle.

Female.—Frons as in *conformis,* cheek narrower than in that species, but little higher than width of parafacial. In other respects as in the male, except that the hind tibia lacks the bristly hairs.

Length, 7 mm.

Type. ♂; Mt. Equinox, Vermont, June 5, 1910. *Allotype.*—♀; Bretton Woods, New Hampshire, June 24, 1913. *Paratypes.*—North Adams, Massachusetts, June 18, 1906; Great Barrington, Massachusetts, June 16, 1915; Capens, Maine, July 17, 1907. All taken by C. W. Johnson.

Type and allotype in collection of Boston Society of Natural History, paratypes in collections of Illinois Natural History Survey and of The American Entomological Society.

Trichopticus diffinis sp. n.

Male.—Similar in color to *spiniger*, but the halteres are yellow.

Differs from *spiniger* in being smaller, and in having the mid femora with a number of long hairs on basal half of postero-ventral surface. The mid tarsus has the fringe of fine hair on postero-ventral margin of joints three to five much weaker than in the two preceding species. The mid tibia in the type has only one posterior bristle, the hind femur has from five to seven strong bristles on apical half of antero-ventral surface. In other respects as in *spiniger*, but the fourth joint of mid tarsus is shorter. Length, 4.25 mm.

Type.—♂; Emigration Canyon, Utah, July 21, 1917, [Coll. Aldrich].

Trichopticus melanderi sp. n.

Male.—Similar in color to *spiniger*, differing only in having the knobs of the halteres yellow.

Eyes almost bare, separated by about the width across posterior ocelli; lower supraorbital bristle proclinate; face concave in profile, the mouth-margin almost in line with base of antennae; cheek over twice as high as width of parafacial, the latter nearly as wide as third antennal joint; antennae not as long as face, third joint nearly twice as long as second; longest hairs on arista a little longer than its basal diameter. Presutural acrostichals hair-like, irregularly four-rowed; postsutural dorso-centrals, three. Abdomen cylindrical, tapered; hypopygial forceps long, slightly knobbed at apices. Fore tibia with hairs on posterior surface longer than elsewhere, and usually with one weak posterior median bristle; fore tarsus distinctly longer than fore tibia; mid femur normal, with slender bristles on postero-ventral surface; mid tibia with one antero-ventral, one or two antero-dorsal, two or three postero-dorsal, and one or two postero-ventral bristles; mid tarsus normal; hind femur with a series of bristles from base to apex on antero-ventral surface, and a much weaker series on apical half of postero-ventral surface; hind tibia almost straight, with from four to six antero-ventral, two or three antero-dorsal, and four to six postero-dorsal bristles, the posterior surface with a few long hairs on middle. Costal thorn small; apex of wing rounded.

Female.—Less intensely black than male, but not so densely gray pruinescent as *spiniger*.

Frons about one-third as wide as head; lower supraorbital not much longer than second; interfrontalia without cruciate bristles. Fore and mid tibiae as in male; hind femur with fewer bristles on antero-ventral surface and none on postero-ventral; hind tibia as in male except that the postero-dorsal surface has only one strong bristle and the posterior surface has no long hairs.

Length, 4 to 4.5 mm.

Type.—♂; Paradise Park, Mt. Rainier, Washington, August, 1917, (A. L. Melander). *Allotype.*—♀; topotypical. *Paratypes.*—Seven males and one female, topotypical; one male, one female, Tuolumne Meadows, California, 9000 feet, August 16, 1916, (G. R. Pilate).

This is the smallest species of the genus I have seen.

The type and allotype are in Professor Melander's collection; the paratypes are placed in the collections of the Academy of Natural Sciences of Philadelphia, the Illinois State Natural History Survey, U. S. National Museum, and that of Dr. Aldrich.

Trichopticus johnsoni sp. n.

Male.—Glossy, bluish black, thorax faintly white pruinescent, with slight indications of four vittae, abdomen with a faint black dorso-central vitta. Legs black, tips of femora and extreme bases of tibiae slightly reddish. Wings at bases, calyptrae and halteres bright orange-yellow.

Eyes with long sparse hairs, separated by a little more than width of anterior ocellus; mouth-margin protuberant; parafacial as wide as third antennal joint; arista with very short pubescence. Thorax without strong presutural acrostichals; four pairs of postsutural dorso-centrals present. Abdomen subovate; hypopygium of average size; fifth sternite normal. Fore tibia unarmed at middle; mid femur elongated, with a group of short blunt bristles on apical third of antero-ventral and ventral surfaces, and eight very long bristles on postero-ventral; hind femur slender, distinctly longer than abdomen, curved, its antero-ventral surface with a series of bristles from before middle to apex; hind tibia much curved, with a series of moderately long setulose hairs from near base to apex on antero-ventral surface, two or three antero-dorsal bristles, two or three postero-dorsal bristles, a series of long erect hairs on apical half of posterior surface, and dense erect setulose hairs on apical half of ventral surface. Costal thorn minute; wing slightly pointed.

Female.—Similar in color to the male.

Eyes very indistinctly hairy; frons one-third as wide as head; interfrontalia without cruciate bristles. Abdomen more pointed than in male. Mid femur with a series of hair-like bristles on postero-ventral surface, and two strong bristles beyond middle on antero-ventral; mid tibia with one or two antero-dorsal and two or three postero-dorsal bristles; hind femur not curved, with fewer and stronger bristles than male; hind tibia slightly curved, with three to five antero-ventral, two or three antero-dorsal and two or three postero-dorsal bristles.

Length, 7 to 8.25 mm.

Type.—♂; North Adams, Massachusetts, June 18, 1906, (C. W. Johnson). *Allotype.*—♀; Glen House, New Hampshire, August 3, 1911. *Paratypes.*—Topotypical with type, one male;

Mt. Washington, New Hampshire, elevation 2500 feet, August 16, 1915, (C. W. Johnson), one female; Douglas, Alaska, (E. Jenne), two females; Franconia, New Hampshire, (Morrison), one male.

The type and allotype are in the collection of the Boston Society of Natural History; one paratype is in the collection of the Illinois Natural History Survey; one paratype is in the collection of the Academy of Natural Sciences of Philadelphia; the two from Alaska are in the collection of A. L. Melander, and the last is in the U. S. National Museum.

Trichopticus brevitarsis sp. n.

Male.—Similar in color to *melanderi*, the halteres black.

Structurally this species closely resembles *villicrurus*, and the armature of the legs is similar, but the tarsi are much shorter, the arista is longer haired, the bristly hairs on ventral surface of mid femur are shorter than the diameter of femur, except in postero-ventral series, the long hairs on posterior surface of hind tibia are confined to basal half, and the species is much smaller, being only 4 mm. in length, as against 5.5 mm. in *villicrurus*.

Type.—♂; Paradise Park, Mt. Rainier, Washington, August, 1917, (A. L. Melander), [Coll. Melander]. *Paratypes*.—Two males, London Hill Mine, Bear Lake, British Columbia, 7000 feet, July 21 and 28, 1903, (R. P. Currie); two males, Kokanee Mt., British Columbia, 8000 feet, August 18, 1903, (R. P. Currie).

POGONOMYIOIDES Malloch

I erected this genus for the reception of a species, the male of which I describe in the present paper. The species was originally represented by one female only. In the present collection there is a male and two females. The genus is closely allied to *Eriphia*, but the male lacks the very conspicuous bristles on apex of fourth tergite and whole of fifth, the abdomen not presenting the blunt appearance of *Eriphia*.

Pogonomyioides atrata Malloch

1919. *Pogonomyioides atrata* Malloch, Rep. Can. Arctic Exped. 1913-16, iii, p. 76c.

Male.—Entirely black, the thorax and abdomen with slight grayish pruinescence. Wings clear. Calyptrae white. Halteres black.

Eyes separated by little more than width of anterior ocellus. Abdomen narrowly ovate; hypopygium small, not remarkably bristled; fifth sternite with a small rounded posterior incision, the angles on each side glossy, chiti-

nized. Fore coxae produced in the form of a large, stout, rounded protuberance at apex anteriorly; fore tibia with one or two postero-ventral bristles, no ventral or posterior bristles; fore tarsus subequal to tibia in length, fourth joint with two bristles at apex on posterior side; mid femur attenuated basally, swollen for a short distance beyond middle and armed on the swollen part ventrally with a clump of very long fine bristles; mid tibia with a variable number of bristles on postero-dorsal and posterior surfaces; hind femur with long bristles on apical half of antero-ventral surface; hind tibia slightly produced at apex on ventral side, with a few short bristles on basal half of antero-ventral surface, a fringe of setulae on antero-dorsal surface which are longer on basal half, and a number of longer bristles on basal half of postero-dorsal surface; basal joint of hind tarsus with a basal ventral bristle. Length, 6.5 mm.

Allotype.—♂; West Coast of Greenland, 1891, (Mengel and Hughes, on the Peary Expedition), [A. N. S. P.]. One other female seen, with same data.

NEODEXIOPSIS gen. n.

This genus is separated from *Cariciella* by the following characters: thorax with four pairs of dorso-central bristles; scutellum with four bristles of equal length; hind tibia with three bristles, one antero-ventral, one antero-dorsal, and one postero-dorsal, the first-mentioned bristle situated apicad of the second and not basad of it as in *Cariciella*.

Genotype.—*Dexiopsis basalis* Stein. Monobasic.

MACORCOENOSIA gen. n.

This genus differs from the preceding by the armature of fore tibia and form of the male abdomen particularly, the latter being elongate and cylindrical, with the fifth sternite exposed, while in *Neodexiopsis* it is ovate and the fifth sternite is usually concealed.

Genotype.—*Coenosia triseta* Stein. Monobasic.

XENOCOENOSIA gen. n.

The characters which serve to distinguish this genus from *Coenosia* are as follows: hind tibia with but one bristle on the antero-dorsal surface; ocellar bristles much weaker than upper orbitals, not longer than postvertical pair; lower posterior sternopleural bristle nearer to upper than to anterior bristle.

Genotype.—*Coenosia calopyga* Loew.

Xenocoenosia major sp. n.

Male.—Similar in color to *calopyga* Loew, differing in having the second antennal joint almost entirely dark brown and the apex of third joint slightly browned, the palpi brownish basally, the abdomen without distinct paired dorsal spots, and lacking the large glossy areas on each side of the third and fourth tergites.

Structurally closely resembles *calopyga*, but the armature of the femora is different. The fore pair and mid pair have rather long bristly hairs on basal two-thirds of antero-ventral surface, the mid femur has a strong bristle at middle on anterior surface, and a series of long slender bristles from base to beyond middle on postero-ventral surface; the hind femur has two long, strong bristles on antero-ventral surface, one before and one beyond middle, basad of and between which there are numerous setulose hairs, the postero-ventral surface has a few long irregular bristles from base to beyond middle; hind tibia with the median antero-dorsal bristle long.

Female.—Similar in color to the male, the antennae darker. The two basal abdominal tergites conspicuously yellowish testaceous.

Armature of the femora as in male, the apical antero-ventral bristle absent in both sexes.

Length, 4.5 to 5.5 mm.

Type and *allotype.*—♂ and ♀; Daytona, Florida, April 7, 1919, [B. S. N. H.]. Two females, *paratypes*, St. Augustine, Florida, April 12 and 18, 1919. Collected by Mr. C. W. Johnson.

Paratypes in collection of The American Entomological Society and Illinois State Natural History Survey.

Xenocoenosia floridensis sp. n.

This species very closely resembles *calopyga*, differing in color and chaetotaxy.

The legs have the femora with longer and denser soft hairs on the ventral surfaces. The mid tibia in the male type has the antero-dorsal median bristle much stronger than the postero-dorsal one, which is not the case in any specimen of *calopyga* which I have seen, but, as the females of both species have the bristles the same, this character may be variable. Length, 3.5 to 4 mm.

Type.—♂; St. Augustine, Florida, April 19, 1919, (C. W. Johnson). *Paratypes* and *allotype.*—One male and two females, topotypical.

Type in the collection of the Boston Society of Natural History, paratypes in collections of The American Entomological Society and Illinois State Natural History Survey.

Coenosia dichaeta sp. n.

Male.—Black, slightly shining, densely gray pruinescent. Head with face, cheeks, and orbits white pruinescent; interfrontalia opaque black when

seen from above; antennae, palpi and proboscis black. Thorax not vittate, the dorsum with brownish pruinescence. Abdomen without dorsal markings. Legs yellow, mid and hind coxae gray; tarsi of mid and hind legs largely fuscous. Wings clear, veins brown, yellow basally. Calyptrae white. Halteres yellow.

Head a little higher than broad in front; frons slightly less than one-third of the head-width at vertex, a little narrowed anteriorly; each orbit about half as wide as interfrontalia, with four bristles and a few hairs; parafacial almost linear; antennae extending nearly to the mouth, third joint angulate at apex; arista almost bare; one or two setulae above vibrissae. Acrostichal setulae in two rows; lower stigmatal bristle directed downward; scutellum with two long lateral bristles. Abdomen slender, cylindrical, slightly compressed apically; hypopygium and fifth sternite small (fig. 50). Legs with the normal number of bristles, which are of moderate length and strength; hind tarsus not much longer than its tibia, the basal joint less than half as long as tibia. Wings a little more than twice as long as wide, rounded apically; costa with fine setulae which are distinctly longer than the diameter of the costal vein; last section of fourth vein about 2.25 as long as the preceding; veins three and four slightly arcuate, almost parallel apically.

Female.—Differs from the male in having the fore coxae and all femora largely fuscous.

Length, 3 mm.

Type.—♂; Grant, Colorado, July 21, 1916, (E. C. Jackson). *Allotype.*—♀; Farewell Creek, Saskatchewan, Canada, July, 1907.

A female from Montana has the apical scutellar bristles present but weak.

Type in collection of U. S. Bureau of Biological Survey.

Coenosia denticornis sp. n.

Female.—Paler in color than *dichaeta*, the frons grayish pruinescent when viewed from above and with the anterior margin rufous yellow. Legs yellow, all coxae and fore femora largely fuscous; tarsi black.

Head as broad as high; frons parallel-sided, a little over one-third as wide as head, each orbit less than half as wide as interfrontalia, with three bristles; antennae not extending to mouth, third joint thorn-like at apex on upper side; arista pubescent (fig. 41). Thoracic chaetotaxy as in *dichaeta*. Costal setulae not as long as diameter of costal vein. Length, 2.5 mm.

Type.—♀; Farewell Creek, Saskatchewan, Canada, July, 1907, [Illinois].

This species most nearly resembles *flavipes* Stein (nec Williston), but the third antennal joint is very differently shaped at apex in the latter.

Coenosia errans n. n.

1897. *Coenosia flavipes* Stein (nec Williston, 1896), Berl. Ent. Zeitschr., XLII, p. 268.

1913. *Coenosia steinii* Johnson (nec Verrall, 1912), Bull. Amer. Mus. Nat. Hist., XXXII, p. 78.

I take this opportunity to propose a new name for this species, the synonymy of which is indicated above.

I have before me two males, which agree perfectly with specimens in our collection collected by Hough in Georgia and named *flavipes* by him.

Localities.—Chestertown, Maryland, August 12, 1901, (E. G. Vanatta); Riverton, New Jersey, September 8, 1901, (H. L. Viereck), [all A. N. S. P.].

Coenosia impunctata sp. n.

Male.—Similar to *lata* Walker, differing in having the thoracic dorsum and dorsum of abdomen unmarked, the fore femora with only a black stripe on dorsum, the mid and hind femora with the apical third blackened dorsally, and the coxae all pale.

Structurally similar to *lata*, but the abdomen is more elongate, the hypopygium smaller, and the incision of the fifth sternite is slightly different. Length, 2.5 mm.

Type.—♂; Mt. Katmai, Alaska, July, 1917, (J. S. Hine), [Coll. Hine]. *Paratype.*—one male, topotypical.

Coenosia nivea Loew var. **brunnescens** var. n.

Male.—Differs from typical *nivea* in having the pruinescence much darker, only the face and cheeks being silvery white. Interfrontalia brown; antennae brownish yellow; palpi testaceous. Thorax with gray pruinescence, slightly brownish on dorsum. Two basal abdominal segments testaceous yellow, remainder gray. Wings not pale at bases.

Antennae shorter than in typical *nivea*. Thorax with an irregular series of weak acrostichals. Lateral prolongations of fifth sternite as in figure 45. Length, 2.5 mm.

Type.—♂; Swarthmore, Pennsylvania, July 22, 1906, [A. N. S. P., Type no. 6230].

Coenosia frisoni sp. n.

Male.—Black, subopaque, very densely pale gray pruinescent. Apex of second and all of third antennal joint, and palpi yellow. Thorax very indistinctly trivittate. Basal abdominal tergite and sides of second yellow; fifth sternite largely yellow. Legs yellow, tarsi slightly darker.

Head as in *flavicoxa* Stein. Body more robust than in that species, the fifth sternite less deeply incised, the tibial bristles much shorter and the antero-dorsal one on mid tibia absent or minute. Length, 2.5 mm.

Type.—♂; Cottonwood Grove, Urbana, Illinois, July 20, 1917, (J. R. Malloch), [Illinois].

Named in honor of Mr. T. H. Frison, who placed at my disposal means of access to the spot where the species was collected, and who has done some very good work in various lines of entomology.

Coenosia argenticeps sp. n.

Male.—Differs from *frisoni* in having the abdomen entirely without yellow color at base and the fifth sternite black.

Structurally similar to *frisoni*, but the tibial bristles are very much longer and more slender, the antero-dorsal and preapical hind tibial bristles being very long, the former exceeding one-half of the tibial length. From *oregonensis* it may be distinguished by the longer and more slender tibial bristles and the presence of but two distinct pairs of dorsal abdominal spots. All three species have the mid and hind tarsi very long, the basal joint of the mid pair being about half as long as the tibia, a character which separates the group from *compressa*, in which the basal joint of mid tibia is less than one-third of the tibial length. Length, 2 mm.

Type.—♂; Gallatin County, Montana, June 16, 1917, [Mont. Exp. Sta.].

Coenosia longispinosa sp. n.

Male.—Black, subopaque, densely gray pruinescent. Frons brownish black, paler in front; face, orbits and cheeks white pruinescent; antennae yellow, second joint partly infuscated; palpi yellow. Thorax rather indistinctly trivittate. Abdomen with a pair of large elongate blackish spots on each tergite, which extend from anterior to posterior margin; fifth sternite brownish. Legs yellow, tarsi slightly infuscated. Wings clear.

Head higher than wide in front; frons a little less than one-third of the head-width, each orbit about one-fourth as wide as interfrontalia, with five bristles; antennae extending four-fifths of the distance to mouth, third joint not angulate at apex; arista pubescent. Thoracic bristles longer than usual, acrostichals two-rowed. Abdomen slender, slightly longer than thorax, bristles not as long as those of thorax; hypopygium and fifth sternite small, the latter with a deep central incision. Legs slender, the bristles on femora and tibiae very long and slender, the preapical and antero-dorsal bristles on hind tibiae each almost as long as the tibia. Venation as in *flaviceps* Stein. Length, 3 mm.

Type.—♂; Grant, Colorado, August 19, 1914, (E. C. Jackson), [U. S. Biol. Surv.]. *Paratype.*—1 ♂; topotypical.

This species has the tibial bristles much longer than those of any other species known to me.

Coenosia laricata sp. n.

Female.—Black, densely pale gray pruinescent. Frons with yellowish gray, face and cheeks with white, pruinescence; antennae reddish yellow,

third joint brownish apically; palpi whitish yellow; proboscis glossy black. Thorax not vittate. Abdomen slightly testaceous on sides of two basal dorsal segments; segments three and four with a pair of blackish spots, the bases of the larger dorsal bristles set in black dots. Legs entirely yellowish testaceous. Wings clear, veins yellow. Calyptrae white. Halteres pale yellow.

Head at least 1.5 as wide as high when seen from in front; frons one-third as wide as head, orbits not differentiated, each orbit with three or four bristles, the upper, backwardly directed one slightly shorter than the second and ocellars; eyes almost hemispherical; parafacial, in profile, linear; cheek about as high as width of third antennal joint, the latter twice as long as second, its apex with a rather sharply produced upper angle; arista with very short pubescence; vibrissa long and strong. Presutural acrostichals two-rowed, rather long; lower stigmatal bristle very minute or absent. Legs short and stout, the femora stouter than in most species of the genus; all tibial bristles long and strong, the antero-dorsal one on mid tibia longer than the postero-dorsal; hind tibia with one or two long setulae on middle of postero-dorsal surface; basal joint of hind tarsus less than one-third as long as tibia, with a short basal ventral bristle. Veins three and four parallel on apical sections, their apices in nearly vertical line. Length, 3.25 mm.

Type.—Cedar Lake, Lake County, Illinois, August 4, 1906, in a tamarack grove, [Illinois].

Coenosia johnsoni sp. n.

Male.—Black, opaque, densely gray pruinescent. Interfrontalia opaque black when seen from above, remainder of head gray pruinescent; base of third antennal joint yellowish. Thorax not vittate. Abdomen with three pairs of rather faint brown spots on dorsum; hypopygium and greater portion of fifth sternite brownish. Legs entirely yellow. Wings slightly yellowish. Calyptrae and halteres nearly white.

Head as high as broad; frons about one-third as wide as head; each orbit with four bristles and a few hairs; parafacial very narrow; antennae not extending over three-fourths of the distance to mouth; third joint not sharply angulate; arista pubescent. Thoracic bristles longer and stronger than those of abdomen; acrostichals two-rowed. Abdomen elongate, cylindrical; hypopygium of moderate size; processes of fifth sternite about twice as long as broad, with long hairs on their inner halves and some strong bristles apically. Femoral bristles long, rather irregularly alternately long and short; femora stouter than usual; tibial bristles normal in number, not very long; hind tarsus not as long as tibia, basal joint less than one-third of the tibial length. Wing over 2.5 as long as broad. Length, 5 mm.

Type.—♂; Gold Rock, Ontario, Canada, July 21, 1905, (H. H. Newcomb), [Illinois].

Coenosia dorsovittata sp. n.

Male.—Black, subopaque, densely gray pruinescent. Head black, with silvery white pruinescence; antennae and interfrontalia with less conspicuous

pruinescence than orbits; palpi black. Thorax when viewed from above with the dorsum brownish black, the lateral margins and pleura with bluish gray pruinescence. Abdomen bluish gray pruinescent, most noticeably so on sides, dorsum with the usual spots fused and forming a broad brown vitta, which is slightly subdivided in center; fourth tergite with a shining, bare, black area along each anterior lateral margin, which is only narrowly visible; hypopygium and fifth sternite black. Legs pale yellow, coxae largely grayish, tarsi slightly infuscated. Wings slightly grayish, white basally.

Frons in profile slightly buccate, one-third as wide as head; each orbit with four bristles, one very weak; parafacial narrowed below; antennae extending nearly to mouth, third joint narrowed apically; arista bare; palpi pointed. Thorax with strong bristles; acrostichals two-rowed. Abdomen a little longer than thorax, cylindrical basally, slightly compressed apically; hypopygium small; processes of fifth sternite about twice as long as broad, rounded at apices, with a few weak bristles. Legs slender, femoral bristles weak; tibial bristles normal in number, short and weak; hind tarsus much longer than tibia, basal joint at least half as long as tibia. Last section of fourth vein over three times as long as preceding; veins three and four slightly divergent apically. Length, 2.25 mm.

Type.—♂; Grant, Colorado, August 19, 1914, (E. C. Jackson), [U. S. Biol. Surv.].

Fannia lasiops sp. n.

Male. Black, thorax and abdomen slightly shining. Frontal and facial orbits silvery, interfrontalia and face grayish pruinose. Abdominal markings consisting of a broad deep-black triangle on each segment, the anterior extremity of each triangle produced stripe-like to anterior margin of segment. Legs black. Wings clear. Calyptrae white. Halteres with knobs fuscous.

Eyes hairy on upper half, separated at narrowest part of frons by a space equal to width across posterior ocelli; cheeks broader than usual, the distance from eye to vibrissa little less than distance between vibrissae; palpi normal. Presutural acrostichals two-rowed. Fore tibia without median bristle, the preapical dorsal one long. Mid femur hollowed out on ventral surface near apex; antero-dorsal surface with a closely placed series of short even bristles from base to apex; antero-ventral surface with long, rather closely placed bristles from base to beyond middle, the series becoming shorter from middle to ventral excavation and the last seven to nine duplicated, the excavation bare except near apex where there are five to six short bristles; postero-ventral bristles weaker and fully as long as antero-ventrals; mid tibia distorted on basal half, swollen on apical half, the ventral pubescence dense, erect, and at least as long as basal diameter of tibia, dorsal surface of tibia with rather long setulae, antero-dorsal surface with one long and one short bristle, postero-dorsal surface with two bristles; mid metatarsus with a sharp spur at base on ventral surface which is as long as third tarsal joint; hind femur curved, armed on antero-ventral surface with a series of long bristles

which extends from base to apex, posterior surface with closely placed long bristles, those on postero-ventral surface shorter and weaker than the antero-ventral series; hind tibia with two dorsal, one antero-dorsal and three antero-ventral bristles, the latter decreasing in length from upper to lower; hind coxae bare above. Third and fourth veins decidedly convergent apically. Squamae subequal. Length, 4.5 mm.

Type.—♂; Augerville Woods, near Urbana, Illinois, March 30, 1918, (J. R. Malloch), [Illinois].

This species is related to *hirticeps* Stein, but differs in the armature of the hind legs.

Hydrophoria nigerrima sp. n.

Male and *female*.—Deep black, distinctly shining. Thorax in male without distinguishable vittae, indistinctly trivittate in female. Abdomen in male with the dorso-central vitta so broad that it covers almost the entire dorsum; in female much narrower. Wings in male slightly infuscate. Halteres black in both sexes.

Male.—Eyes separated by more than width across posterior ocelli; orbits with very long bristles on entire length; longest hairs on arista not as long as width of third antennal joint; parafacial in profile wider than third antennal joint and more than half as wide as height of cheek, the latter with numerous long, slender bristles on margin, some of these extending above vibrissa. The portion of fourth tergite (third visible) which overlaps is ventrally rather densely bristled; fifth sternite with numerous rather long hairs, the inner margin of each process basally with a fringe of long setulose hairs. Hind femur with a series of long slender bristles on almost the entire length of postero-ventral surface; hind tibia with from five to seven bristles of unequal lengths. Costal thorn small.

Female.—Differs from the male in having the eyes separated by about one-half the head-width, the orbits densely hairy, with at least one supra-orbital forwardly directed, and one pair of cruciate bristles and a few hairs on interfrontalia. The abdomen is pointed at apex, and there are no apical thorns.

Length, 6 to 7 mm.

Type.—♂; Mt. Rainier, Washington, 7000 to 9000 feet, on snow, August, 1917, (A. L. Melander). *Allotype*.—♀; same data. *Paratypes*.—Seven specimens, same data as type; two males and two females, Paradise Park, Mt. Rainier, August, 1917, (A. L. Melander); one male, one female, Mt. Rixford, California, on snow, August 12, 1914, (Coll. Aldrich).

The type has been returned to Professor Melander, and paratypes have been placed in the collections of the Academy of

Natural Sciences of Philadelphia and the Illinois Natural History Survey.

Hydrophoria polita sp. n.

Male.—This species most closely resembles *arctica* Malloch, but the basal hypopygial segment, on the greater portion of its surface above, is armed with weak erect hairs, the stout bristles being confined to apical half. The eyes are separated at narrowest part of frons by a distance about as wide as anterior ocellus; the longest hairs on arista are as long as width of third antennal joint; the hind femur has strong bristles from base to beyond middle on postero-ventral surface.

Female.—Similar in general appearance to the female of *divisa*. The abdomen is much less noticeably shining than in *arctica*, without distinct lateral checkerings, and the dorso-central vitta does not reach apex. Chaetotaxy of legs as in male.

Length, 7 to 7.5 mm.

Type.—♂; Bozeman, Montana, elevation 5400 feet, July 23, 1902, [Mont. Agric. Station]. *Allotype.*—♀; topotypical. *Paratype.*—♂; in poor condition, Wells, Nevada, July 12, 1911, (Aldrich).

Hydrophoria katmaiensis sp. n.

Male.—Differs from the general rule in the genus in having the tibiae largely rufous-yellow, and the long hairs at junction of calyptra brown or fuscous.

Eyes separated by about width of anterior ocellus; parafacial much narrower than in *polita*, not as wide as third antennal joint; cheek very much rounded off posteriorly. Basal hypopygial segment with rather long bristly hairs; armature of dorsum of abdomen weak, in sharp contrast to the strong bristles on the portions of dorsal segments which curve under abdomen, especially to those on incurved portions of segments three and four; fifth sternite with long bristly hairs, the processes fringed on basal half of their inner margins. Hind femur with bristles to beyond middle on postero-ventral surface; hind tibia with two long and one or two short (basal) bristles on postero-dorsal surface. Costal thorn very small. Length, 6.75 mm.

Type.—♂; Katmai, Alaska, August, 1917, (J. S. Hine), [Coll. Hine].

Hydrophoria occidentalis sp. n.

Male.—Similar to *polita* in general appearance, but the hypopygium has only slender hairs on basal portion, the preceding segment is largely pruinescent and armed with numerous hairs, and the hind tibia has but three postero-dorsal bristles. Length, 7 mm.

Type.—♂; Wells, Nevada, July 12, 1911. *Paratype.*—♂; Pullman, Washington, June 8, 1898, [Wash. Sta. Coll.]. Type in collection of Dr. Aldrich.

Hydrophoria proxima sp. n.

Male.—General color more intensely black than in *divisa*, face black; abdomen with a broad dorso-central vitta, which is laterally distended on anterior and posterior margins of each segment.

Eyes more widely separated than in *divisa*, the interfrontalia with a pair of cruciate bristles; parafacial broader than in *divisa*, cheek with fewer marginal bristles. Presutural acrostichals two-rowed. Mid femur with the postero-ventral bristles not extending to base.

Female.—Similar to the female of *divisa*, but darker in color, the tibiae being usually black.

The mid tibia has a strong antero-ventral bristle beyond middle, but in other respects the species are very similar.

Length, 5.5 mm.

Type.—♂; Machias, Maine, July 21, (C. W. Johnson), [B. S. N. H.]. *Allotype.*—♀; Princeton, Maine, July 12, 1909. *Paratypes.*—One male and one female, same data as allotype, and same collector. Paratypes in collections of Illinois State Natural History Survey and The American Entomological Society.

Hydrophoria flavohalterata sp. n.

Male.—This species shows an approach to those with the third tergite tufted on latero-posterior angles, but the peculiar brownish or fuscous pencil or tuft of stiff bristly hairs is absent, there being only a greater number of erect bristles present than in *uniformis* and its allies.

Eyes separated by at least the width across posterior ocelli; arista with the longest hairs but little longer than its basal diameter. Third tergite with strong bristles on latero-posterior angles; fifth sternite fringed along the inner margins of processes and with a few bristly hairs at or near apices. Hind femur with bristles on basal half of postero-ventral surface; hind tibia normally with three postero-dorsal bristles, the antero-ventral surface with four or five short bristles.

Female.—I can not separate by any structural character the females of this species from those of *borealis*. Both very closely resemble the female of *spinicauda*, but are separable from it by the absence of presutural acrostichals. Length, 5 to 6.25 mm.

Type.—♂; Moscow, Idaho, May 5, 1912, [Coll. Aldrich]. *Allotype.*—♀; same locality as type, June 6, 1912. *Paratypes.*—Same locality as type, May 22, 1913, April 23, 1912, July 13, 1907, June 5, 1912; Kamiac Butte, Washington, June 1, 1912; Lawyer's Canyon, Idaho, June 16, 1909; [all from the collection of Dr. Aldrich]; Ilwaco, Washington, August 27, 1917. (A. L. Melander).

Hydrophoria coloradensis sp. n.

Male.—Similar to the preceding species in color, differing in having the base of radius yellowish, and the dorso-central abdominal vitta more distinctly tapered apically. Thorax with at least one pair of well developed presutural acrostichals; mesopleura with three or four bristles near anterior upper angle. The costal thorns are smaller than in *flavohalterata*, and the fifth sternite more densely hairy. Length, 6 mm.

Type.—♂; Tennessee Pass, Colorado, July 25, 1917, [Coll. Aldrich].

This species may be *nuda* Schnabl.

Hydrophoria borealis sp. n.

Male.—Color darker than in *uniformis*, and similar to that of *flavohalterata*. Eyes separated by a distance at least as great as width across posterior ocelli; parafacial in profile at base of antennae distinctly broader than third antennal joint; hypopleura bare; fourth tergite with a tuft of fuscous bristly hairs on each posterior lateral angle; processes of fifth sternite broad, fringed along the inner margins with fine hairs, the disc with a few bristly hairs. Hind femur with a series of long, slender bristles on basal half of postero-ventral surface.

Female.—Similar to the male in color, but not readily separable from *flavohalterata*. Parafacial in profile but little narrowed below, as wide as third antennal joint for almost its entire length. Hind femur with several long hair-like bristles at base on postero-ventral surface. At least one of the costal thorns long and conspicuous, sometimes as long as inner cross-vein, or nearly so.

Length, 5 to 6.25 mm.

Type.—♂; Katmai, Alaska, June, 1917, (J. S. Hine). [Coll. Hine]. *Allotype.*—♀; same locality as type. *Paratypes.*—1 ♂, topotypical; eleven specimens, Mt. Constitution, Washington, July 17, 1909, [Coll. Dr. Aldrich].

Hydrophoria elongata sp. n.

Male.—Differs from the preceding species and *ambigua* in having the abdomen more brownish gray and with a very indistinctly limited dorso-central vitta.

The eyes are separated by a space at least equal to width across posterior ocelli; the arista has the longest hairs about equal in length to width of third antennal joint; parafacials but little narrowed below, as wide as third antennal joint; apical portion of proboscis stouter than in *borealis*. Thorax with one or two pairs of presutural acrostichals. Abdomen more distinctly tapered than in other species, the second tergite very noticeably longer than third, the latter about twice as long as fourth; fifth sternite glossy black, almost entirely bare on disc of processes, their inner margins with a fringe of hairs. Fore tibia with one or two posterior bristles, one of which is longer

and more slender than usual; fore tarsus with a very long bristle at apex of fifth joint above; bristles on antero-ventral surface of hind femur more widely separated than usual, those on basal half of femur not as long as diameter of femur. Costal thorn short.

Female.—Similar to the female of *ambigua* in general habitus. The abdomen is more yellowish, and has a narrower dorso-central vitta and less conspicuous checkerings.

Length, 6.5 to 7.5 mm.

Type.—♂; Pullman, Washington, [Illinois]. *Allotype.*—♀; topotypic. *Paratypes.*—Same locality, [Coll. Dr. Aldrich]. Six specimens.

MACROPHORBIA gen. n.

Generic Characters.—Differs from *Hylemyia* in having four pairs of post-sutural dorso-central bristles, the lower calyptra almost or quite as large as the upper, the abdomen broadly ovate in male, the mid tibia in both sexes with one or two median ventral bristles, and the cruciate frontal bristles in female duplicated.

Genotype.—*Macrophorbia houghi* sp. n.

Macrophorbia houghi sp. n.

Male and *female.*—Black, glossy, thorax and abdomen with bluish gray pruinescence. Head black, orbits and face with silvery pruinescence; interfrontalia in female opaque black. Thorax quadrivittate. Abdomen in male with dense pruinescence on dorsum, when seen from behind with a narrow black central vitta, and a black triangular mark at each anterior lateral angle of each segment; hypopygium glossy black; abdomen of female almost without pruinescence. Legs black. Wings clear. Halteres with yellowish knobs.

Male.—Eyes bare, separated at narrowest part of frons by a distance less than equal to width across posterior ocelli; parafacial at widest point nearly as wide as third antennal joint, slightly narrowed below; cheek with its posterior margin rounded off, the posterior half almost entirely covered with hairs, anterior half with hairs along lower margin only; vibrissa strong, the hairs extending upward on facial ridges about one-third of the distance to base of antennae; third antennal joint broad, about 1.5 as long as second; arista nearly bare, second joint distinctly longer than thick, third swollen for a short distance at base. Thorax with from two to four pairs of presutural acrostichals; anterior two pairs of post sutural dorso-centrals weaker than the posterior; sternopleural bristles 2:2, some of the hairs near posterior upper angle bristle-like. Abdomen not 1.5 as long as broad; dorsum rather densely haired; hypopygium large; processes of fifth sternite with dense, short hairs along their inner third and long irregular bristles on outer two-thirds.

Fore tibia much longer than fore tarsus, armed with about six short bristles from base to apex on antero-dorsal surface, and two or three longer bristles on posterior surface; mid tibia with two or three antero-dorsal, three or four postero-dorsal, two or three posterior and one or two ventral bristles; hind femur with an almost complete series of bristles on antero-ventral surface, and three or four on middle of postero-ventral surface; hind tibia with four or five antero-ventral, about nine antero-dorsal and from five to seven postero-dorsal bristles, the posterior surface with a number of setulose hairs on basal half. Costal thorn very small; outer cross-vein very much curved; third vein ending just in front of apex of wing, fourth considerably beyond it.

Female.—Differs from the male in having the frons a little over one-third as wide as head, the interfrontalia with two pairs of cruciate bristles, the palpi broadened, the fore tibia with one of the antero-dorsal bristles much stronger than the others, and the hind tibia without posterior setulose hairs.

Length, 7 to 9 mm.

Type.—♀; New Bedford, Massachusetts, May 10, 1896, (Hough). *Allotype.*—♂; Hampton, New Hampshire, April 26, 1910, (S. A. Shaw). *Paratypes.*—Two males, Sherborn, Massachusetts, April 30, 1912, May 26, 1913; one male, Danvers, Massachusetts, May 19, 1914; one female, Melrose Highlands, Massachusetts, May 3, 1912, (H. E. Smith); one male, Clementon, New Jersey, April 21, 1902, (C. W. Johnson).

The type and one male paratype are in the collection of the Illinois Natural History Survey, the allotype, a male and a female paratype are in the collection of the Boston Society of Natural History, and one male paratype is in the collection of The American Entomological Society.

ANTHOMYIELLA gen. n.

This genus differs from *Anthomyia* in having the propleura bare cephalad of the spiracle, and in having a very long strong bristle on dorsal surface of fore tibia distad of middle, the latter possessed by no allied genus known to me.

Genotype.—*Anthomyia pratincola* Panzer.

Anthiomyiella pratincola (Panzer)

This European species is very widely distributed throughout North America, occurring commonly on various flowers such as golden rod. I have taken it commonly on *Chrysopsis* and *Solidago* in the sand regions of Illinois.

There is one specimen in the collection before me from Swarthmore, Pennsylvania, July 23, 1905, [A. E. S.].

XENOPHORBIA gen. n.

This genus is separable from *Hylemyia* by the following combination of characters: Third antennal joint barely longer than second, much broader at apex than at base; face elevated in center between bases of antennae, the latter distinctly separated, the elevation forming a broad flat ridge, which gradually decreases in height, to midway to mouth-margin; vibrissal angle very much produced, the distance from its anterior margin to lower margin of eye about twice as great as width of parafacial at base of antenna; palpi club-shaped; thorax with four pairs of post-sutural dorso-central bristles; posthumeral bristle normally duplicated.

Genotype.—*Stomoxys muscaria* Fabricius.

Xenophorbia muscaria (Fabricius)

This species, which has generally been referred to *Phorbia*, is common in the Northwest. I have found it very commonly on flowers of willows and dandelion on the hills in Scotland.

Pegomyia luteola sp. n.

Male.—Yellowish testaceous, slightly shining. Frontal triangle red, orbits silvery, third antennal joint almost entirely brown, palpi yellow; occipital hairs black. Abdomen with whitish pruinescence on dorsum, when viewed from behind a rudimentary dorso-central vitta is visible; posterior margins of tergites narrowly fuscous; lateral processes of fifth sternite black, covered with black hairs. Legs yellow, apices of hind femora slightly browned; tarsi black. Wings clear. Calyptrae and halteres yellow.

Eyes separated by about the width of anterior ocellus, the orbits contiguous for a short distance below ocelli; third antennal joint on its inner side about 1.5 as long as second; arista pubescent, slightly swollen at base; profile as in *unicolor* Stein, the cheeks less than one-sixth as high as eye; a small hair above vibrissa. Thorax as in *unicolor*, but the anterior acrostichals are separated by less space than they are from the dorso-centrals, and there is but one irregular series of setulae between them. Abdomen depressed, the hypopygium large; fifth sternite with its lateral processes densely covered with erect black hairs. Fore tibia with an antero-dorsal and a posterior bristle; mid tibia with one antero-dorsal, one postero-dorsal, and two posterior bristles; hind femur with a series of antero-ventral bristles which does not extend to base, and a few shorter bristles on middle of postero-ventral surface; hind tibia with one antero-ventral, two antero-dorsal and two postero-dorsal bristles. Outer cross-vein almost straight; costal thorn minute. Length, 5.75 mm.

Type.—♂; Eastport, Maine, July 14, (C. W. Johnson), [B. S N. H.].

This species resembles *unicolor* Stein, but may be separated from it and allied species by the armature of the fifth sternite.

Pegomyia unguiculata sp. n.

Male.—Black, shining, with moderately dense grayish pruinescence. Head black, parafacials yellowish in front at base of antennae; antennae black; palpi yellowish testaceous. Thorax indistinctly vittate. Abdomen with a rather indistinct black central vitta on second tergite, and a large subtriangular black mark on third and another on fourth; hypopygium glossy black; fifth sternite glossy brownish black. Legs yellowish testaceous, fore femora above, and mid and hind femora on apical third above slightly brownish; tarsi fuscous. Wings clear, veins brown. Calyptrae and halteres yellow.

Eyes separated by not more than width of anterior ocellus; third antennal joint about twice as long as second, and three times as long as height of cheek; arista almost bare; parafacial at base of antennae not as wide as third antennal joint, much narrowed below. Thorax with two pairs of widely separated presutural acrostichals, between which there are a few hairs; prealar very small; post humeral duplicated; scutellum with a few hairs on disc and a number on lateral margins; sternopleurals 1:2; many hairs surrounding stigmatal bristle. Abdomen depressed; second tergite (first visible) longest, the others becoming progressively shorter to fifth; hypopygium larger than usual, the basal segment with numerous long bristly hairs; fifth sternite with the processes as shown in figure 40. Fore tibia with or without an antero-dorsal and a posterior bristle beyond middle; mid tibia with bristles as in preceding species; hind femur with a series of rather irregular widely spaced bristles on antero-ventral surface, and another one of shorter bristles on basal three-fifths of postero-ventral; hind tibia with one or two antero-ventral, three antero-dorsal and two postero-dorsal bristles. Wings as in *unicolor* Stein. Lower calyptra slightly protruded. Length, 4.5 to 5 mm.

Type.—♂; Lake Louise, Alberta, Canada, July 15, 1908, (C. S. Minot), [B. S. N. H.]. *Paratypes.*—Seven males, topotypical.

This species may be readily distinguished from any of its allies by the peculiar fifth abdominal sternite.

Pegomyia labradorensis sp. n.

Male.—Reddish testaceous, shining. Orbits and parafacials blackened except anteriorly; third antennal joint largely brown; palpi yellow. Thorax with a median fuscous vitta. Abdomen darker than thorax, with a dorsocentral series of reddish brown elongate spots. Legs reddish testaceous; tarsi fuscous. Wings yellowish, veins brown. Calyptrae and halteres yellow.

Eyes separated by about the width between posterior ocelli; parafacial at base of antennae about as wide as third antennal joint, a little narrowed below; cheek a little higher than width of third antennal joint, with a series

of marginal bristles; arista pubescent; third antennal joint twice as long as second. Posthumeral bristle duplicated, no setae adjacent to it; prealar bristle long; prosternal plate almost parallel-sided anteriorly. Abdomen subcylindrical, slightly tapered; fifth sternite with moderately long processes which are rounded apically and unchitinised, have some very fine hairs along inner margins and some long bristles on apical half. Fore tibia with an antero-dorsal and a posterior bristle; fore tarsus much longer than fore tibia; mid femur with two antero-ventral bristles, one near base and the other near apex, and a strong postero-ventral bristle near base; mid tibia with one antero-dorsal, one postero-dorsal, and one or two posterior bristles; hind femur with an irregular series of antero-ventral bristles, and three or four strong bristles on basal half of postero-ventral surface, the surface hairs long; hind tibia with one antero-ventral, two antero-dorsal and two postero-dorsal bristles, and a posterior bristle near base, which is most exceptional in this genus. Costal thorn moderately long. Length, 6 mm.

Type.—♂; Nain, Labrador, August, 1918, [Illinois].

Pegomyia triseta sp. n.

Male.—Yellowish or reddish testaceous. Back of head, cheeks and orbits blackened, gray pruinose; antennae rufous yellow, third joint infuscated on outer side except basally; palpi yellow. Thorax with the exception of the anterior lateral angles and the scutellum black, gray pruinose, the dorsum indistinctly vittate. Abdomen slightly gray pruinose on dorsum, and with a darker, reddish testaceous dorso-central vitta. Legs reddish testaceous, the tarsi infuscated. Wings, calyptrae, and halteres yellowish.

Eyes separated by about the width of anterior ocellus; third antennal joint about 2.75 as long as second; parafacial narrower than third antennal joint at base of antennae, much narrowed below; cheek barely half as high as length of third antennal joint. Thorax with two or three pairs of strong presutural acrostichals and beside them some weaker hairs; prealar not over one-third as long as the bristle behind it; posthumeral bristle duplicated; sternopleurals 1:2; one or two hairs at base of stigmatal bristle. Abdomen depressed; second tergite longest; hypopygium small; fifth sternite with the processes rather short, not broad, unchitinised, the surface close to inner margins with rather dense erect short black hairs, but not fringed. Fore tibia with an antero-dorsal and one or two posterior bristles; mid tibia as in preceding species; hind femur with similar armature to that of preceding species; hind tibia with one antero-ventral, three or four antero-dorsal and usually three postero-dorsal bristles. Veins three and four slightly convergent apically. Lower calyptra slightly protruded. Length, 6 mm.

Type.—♂; Cottage Beaulieu, Montreal, Canada, June 14, 1906, [Illinois]. *Paratypes*.—Two males; Auburndale, Massachusetts, June 13, 1908, (C. W. Johnson).

This species resembles *winthemi* Meigen in habitus and size, but differs in color of palpi, and armature of fifth sternite, tibiae and thorax.

Pegomyia fuscofasciata sp. n.

Male.—Differs from the preceding species in having the head black with the exception of the second antennal joint and base of third and the palpi, the thorax with the exception of the apex of scutellum black, and the abdomen with a narrow fuscous fascia on posterior margin of each tergite.

Head as in preceding species, but the third antennal joint broader and not so long. Thorax with posthumeral bristle duplicated and no small adjacent hairs; sternopleurals 2:2, the lower anterior one weak, sometimes absent. Abdomen depressed; tergites becoming progressively shorter to fourth; hypopygium larger than usual, distinctly but not greatly protruded ventrally; fifth sternite with the processes short, their inner margins with erect fine hairs. Armature of legs as in *triseta*, but the hind tibia has two postero-dorsal bristles. Veins three and four slightly convergent apically. Lower calyptra very noticeably protruded. Length, 4.25 to 5 mm.

Type.—♂; Barnstable, Massachusetts, July 5, 1906, [B. S. N. H.]. *Paratype.*—Two males; Edgartown, Massachusetts, June 28, (C. W. Johnson); one male, Southbridge, Massachusetts, July 27, 1912.

Most nearly related to *triseta*.

Pegomyia spinigerellus sp. n.

Male.—Brownish black, slightly shining, with dense grayish pruinescence. Head rufous, occiput and parafacials partly gray; third antennal joint fuscous except at base. Thorax not distinctly vittate; scutellum slightly testaceous apically. Abdomen yellowish testaceous, dorsum infuscated except at apices of tergites, with a poorly defined brown dorso-central vitta, the bristles and hairs set in brown dots. Legs yellowish testaceous, femora slightly darker, tarsi subfuscous. Wings clear, cross-veins narrowly infuscated. Calyptrae and halteres yellow.

Eyes separated by nearly the width across posterior ocelli; orbits linear above, each with three fine bristles on lower half; parafacial at base of antennae a little wider than third antennal joint, slightly narrowed below; antennae extending about three-fourths of the way to mouth-margin, third joint about 1.5 as long as second; arista very long, second joint about as long as thick, pubescence very short; cheek higher than length of third antennal joint, with a series of bristles on lower margin. Presutural acrostichals short, two-rowed; post-humeral not duplicated, the area laterad of post-humeral bare; prealar absent; sternopleurals 1:2. Abdomen cylindrical; hypopygium normal in size; fifth sternite with the processes short, rounded apically, not glossy, with a few weak setulose hairs. Fore tibia with an antero-dorsal and one or two posterior bristles near middle, the apex with

posterior, postero-dorsal, dorsal, and a weak antero-dorsal bristle; fore tarsus much longer than tibia; mid femur with a strong bristle beyond middle on antero-ventral surface; mid tibia with the same number of bristles as in the preceding species; hind femur with two or three bristles on basal half and two or three on apical half of antero-ventral surface, a rather wide space between the series, and a few bristles on basal half of postero-ventral surface; hind tibia with the usual five bristles. Costal thorn much longer than the inner cross-vein; costal setulae at least twice as long as diameter of costa up to apex of auxiliary vein, beyond that point a little longer than costal diameter; third vein with a few microscopic setulae at base. Lower calyptra not or very little protruded. Length, 4.5 to 5 mm.

Type.—♂; Havana, Illinois, April 30, 1914, [Illinois]. *Paratypes*.—1 ♂; Havana, Illinois, June 3, 1918; 1 ♂; Meredosia, Illinois, August 22, 1917. All three specimens were taken by the writer in dry sandy places, very probably associated with some of the very numerous burrowing bees which occur there.

Allied to *spinosissima* Stein, but that species is larger and has the eyes separated by much more than the width across posterior ocelli.

Pegomyia emmesia sp. n.

This species is so closely related to *Hylemyia juvenilis* Stein that it is necessary only to indicate the points of difference.

Male.—Eyes more widely separated than in *juvenilis*, second antennal joint partly pale, arista with sparse short hairs, the longest hairs not nearly as long as width of third antennal joint, palpi much smaller and not broadened. Fifth sternite without dense brush-like fringe of stiff short black setulae on basal half of inner margin of each process. Wings yellowish. Hind tibiae with a posterior bristle in line with the upper postero-dorsal one.

Male.—Eyes more widely separated than in *juvenilis*, second antennal joint partly pale, arista with much shorter hairs, palpi much smaller and not broadened, wings yellowish.

Female.—Differs from the female of *juvenilis* in having the cruciate frontal bristles absent, the arista shorter haired, the palpi smaller and not dilated, and the wings conspicuously yellow. The hind tibia in both species in this sex have the same armature and the fore tarsi are slender.

Length, 5 to 6.5 mm.

Type.—♂; Savanna, Illinois, June 14, 1917, (J. R. Malloch), [Illinois]. *Allotype*.—♀; same locality as type, June 11, 1917, (J. R. Malloch). *Paratypes*.—Males and females; Savanna, Illinois, June 13, 14, 1917; Elizabeth, Illinois, July 7, 1917; Urbana, Illinois, July 21, 1889, (C. A. Hart); Oregon, Illinois,

June 20, 1917, (J. R. Malloch); Plummer's Island, Maryland, April 26, 1908, July 11, 1909, September 1, 1907, September 29, 1915 and October 22, 1915, (W. L. McAtee); June 30, 1907 and October 13, 1906, (A. K. Fisher); Swarthmore, Pennsylvania, June 11, 1905 and September 3, 1914, (E. T. Cresson, Jr.). Twenty specimens.

The Illinois specimens are in the collection of the Illinois Natural History Survey; the Maryland specimens are in the collection of the U. S. Bureau of Biological Survey; and the Pennsylvania specimens in the collection of The American Entomological Society.

Pegomyia subgrisea sp. n.

Male.—Black, opaque, densely gray pruinescent. Interfrontalia, anterior margin of parafacial at base of antennae, anterior third of cheeks and apex of second antennal joint, rufous; palpi fuscous. Dorsum of thorax with two faintly indicated linear dark submedian vittae on anterior half. Abdomen with a dark gray linear dorso-central vitta; sixth tergite, hypopygium, and fifth sternite reddish testaceous. Legs reddish testaceous, fore femora with a dark gray stripe on postero-dorsal surface, tarsi subfuscous. Wings clear, veins yellow. Calyptrae and halteres yellow.

Eyes separated by about three times the width across posterior ocelli; each orbit with three or four bristles on anterior half; parafacial at base of antennae distinctly wider than third antennal joint, a little narrowed below; cheek a little higher than widest part of parafacial; third antennal joint over twice as long as second; arista with very short pubescence. Thorax with one pair of strong presutural acrostichals; prealar much more than half as long as the bristle behind it; post-humeral not duplicated; sternopleurals 1:2. Abdomen cylindrical; hypopygium moderate in size; fifth sternite with the processes of moderate length, rounded at apices, not chitinised, with microscopic hairs and two or three downwardly directed setulae on inner margin in apical half, and some long bristles on outer half. Fore tibia with an antero-dorsal and two posterior bristles beyond middle; mid femur with a strong bristle near base and another beyond middle on antero-ventral surface, and two or three bristles on basal half of postero-ventral; mid tibia with an antero-ventral, one antero-dorsal, one postero-dorsal and three or four posterior bristles; hind femur with a series of five or six strong, widely-spaced bristles on antero-ventral surface, and three or four on basal two-thirds of postero-ventral; hind tibia with two antero-ventral, two antero-dorsal and two postero-dorsal bristles. Costal thorn longer than inner cross-vein, the setulae longer than costal diameter; outer cross-vein much curved; last section of fourth vein not longer than preceding section. Length, 8 mm.

Type.—♂; Bozeman, Montana, July 14, 1906 [Illinois].

Differs from *flavicans* Stein in having the apex of the abdomen reddish testaceous, the mid tibia with an antero-ventral bristle

and the hind tibia with two antero-ventral bristles instead of one.

Pegomyia quadrispinosa sp. n.

Male.—Similar to *subgrisea* in color; the cheeks and parafacials reddish, abdomen entirely black, fore femora and coxae almost entirely black.

Eyes separated by over twice the width across posterior ocelli; each orbit with seven or eight bristles on anterior half; arista with its longest hairs a little longer than its basal diameter; profile as in *subgrisea*. Thorax with two pairs of strong presutural acrostichals; post-humeral duplicated. Processes of fifth sternite longer than in the preceding species, but in other respects similar. Fore tibia with one antero-dorsal and one posterior bristle; mid femur as in *subgrisea;* hind femur with a series of strong, rather irregular, and somewhat closely-placed bristles from base to apex on antero-ventral surface, and a few similar bristles on basal half of postero-ventral; hind tibia with two or three antero-ventral, two antero-dorsal and two postero-dorsal bristles. Wings as in *subgrisea*.

Female.—Differs from the male in having the fore femora with a fuscous stripe on postero-dorsal surface.

Frons over one-third of the head-width; interfrontalia without cruciate bristles; orbits bare except for the strong bristles.

Length, 7 to 8 mm

Type.—♂; Gallatin, Montana, July 9, 1900, [Illinois]. *Allotype.*—♀; Monida, Montana, June 27, 1913.

Pegomyia fringilla sp. n.

Male.—Black, slightly shining, thorax and abdomen with drab-gray pruinescence. Parafacials and cheeks brownish; palpi and antennae black. Thorax with four black vittae. Abdomen with a rather broad black dorso-central vitta, which is slightly interrupted at posterior margin of each tergite. Legs black, hind tibiae reddish. Wings clear, veins black, paler basally. Calyptrae dull yellow. Halteres yellow.

Eyes large, separated at narrowest part of frons by about the width of anterior ocellus; parafacial at base of antenna about half as wide as third antennal joint, narrowed below; cheek about as high as width of third antennal joint, with a series of bristles along the lower margin, two or three of those near anterior margin upwardly curved; vibrissal angle not produced; arista almost bare. Thorax with three pairs of acrostichals and some short hairs in front of suture; prealar about one-fourth as long as the bristle behind it; sternopleurals 1:2. Abdomen depressed, rather broad, sides subparallel; hypopygium small; processes of fifth sternite short, narrow, slightly chitinised apically, with their inner margins sparsely fringed with short hairs on basal half, and no long surface bristles. Fore tibia with a posterior median bristle, the apical dorsal and posterior bristle of moderate size; fore tarsus slender, longer than tibia; mid femur with three or four bristles on basal half of postero-ventral surface, mid tibia with one antero-dorsal, one postero-dorsal and

two or three posterior bristles; hind femur with a series of bristles on antero-ventral surface and another of shorter bristles on basal half of postero-ventral; hind tibia with one antero-ventral, three antero-dorsal and two postero-dorsal bristles. Costal thorn very small; wing slightly pointed; third and fourth veins slightly convergent apically, the former ending almost in wing-tip; outer cross-vein curved. Lower calyptra protruded.

Female.—Differs from the male in being opaque, densely gray pruinescent, and in having the interfrontalia, parafacials and the cheeks largely rufous, the thorax very indistinctly brown vittate, the abdomen with the dorso-central vitta very faint, and all tibiae rufous.

Interfrontalia without cruciate bristles; orbits well defined, each about one-half as wide as interfrontalia. Fore tibia with an antero-dorsal bristle beyond middle; antero-dorsal mid tibial bristle very much stronger than in male; hind femur with fewer bristles on antero-ventral and postero-ventral surfaces. Costal thorn larger than in male.

Length, 5 mm.

Type.—♂; Swarthmore, Pennsylvania, May 5, 1907, [A. N. S. P., Type no. 6231]. *Allotype.*—♀; topotypical. *Paratypes.*—One male, topotypical; two males and one female, Augerville Grove, Urbana, Illinois, April 18, 1919; one male, Savoy, Illinois, May 4, 1916, on apple blossoms, (J. R. Malloch); one male, Falls Church, Virginia, April 27, 1915, (C. T. Greene).

This species superficially resembles *Hylemyia trivittata* Stein, but the abdomen has a broader dorsal vitta, and is not conspicuously narrowed in the male at apex, nor is the fourth tergite conspicuously elongated in the female, and the bristling of the hind tibia is different.

Eremomyioides fuscipes sp. n.

Male and *female.*—Black, slightly shining. Orbits, face, and cheeks with whitish pruinescence, anterior margin of interfrontalia in both sexes usually reddish; second antennal joint rufous. Wings slightly infuscated; inner cross-vein clouded. Calyptrae white. Halteres yellowish, the knobs brownish yellow.

Male.—Eyes separated by a little more than the width across posterior ocelli; orbits with hair-like bristles to beyond middle; second antennal joint without pruinescence on inner surface, the basal half granulose, apical half with some rather large irregular punctures, the apical margin distinctly angulated; third joint rounded at apex, minutely pilose; arista microscopically pubescent; vibrissa long, a series of six or seven long bristles ventrad of it, and a group of about a dozen short stout bristles at its base; parafacial wider than third antennal joint and over half as wide as height of cheek. Post-humeral bristle usually duplicated; three pairs of long presutural acrostichals present normally; prealar bristle very long. Fifth abdominal sternite with

very fine hairs on inner margins of processes, the apical half of each process with short bristly hairs on its inner half. Normal bristling of tibiae as follows: fore tibia, one antero-dorsal, two posterior; mid tibia, one antero-ventral, one antero-dorsal, one postero-dorsal and two or three posterior; hind tibia, two antero-ventral, two antero-dorsal and two postero-dorsal. Costal setulae not longer than diameter of costal vein; costal thorn as long as inner cross-vein.

Female.—Differs from the male in having the eyes separated by over one-third of the head-width; the interfrontalia usually with a few weak hairs near where the cruciate bristles of other genera occur, and the second, third and fourth fore tarsal joints slightly but distinctly dilated.

Length, 6.75 to 7.5 mm.

Type.—♂; Urbana, Illinois, March 11, 1918, [Illinois]. *Allotype.*—♀; topotypical. *Paratypes.*—From same locality as type, March 16, 17, and 18, 1918; fifteen specimens, taken by T. H. Frison and the writer at Augerville woods; one male, March 3, 1918, Brownfield woods, (T. H. Frison); one male, Homer, Illinois, March 21, 1909; one male, Plummer's Island, Maryland, April 7, 1912, (W. L. McAtee).

Eremomyioides similis sp. n.

Male and *female.*—Similar in color to the preceding species.

Male.—Differs from *fuscipes* in having the second antennal joint transverse at apex on inner side, not slightly produced centrally, so that the third joint is longer than the greatest length of second; the costa with the setulae more widely placed and as long as or longer than diameter of costal vein.

Female.—Differs from the female of *fuscipes* as does the male, and, in addition, the second, third and fourth fore tarsal joints are much more distinctly broadened, the fourth being less than twice as long as its greatest width.

Length, 6 to 7.5 mm.

Type.—♀; Tuscola, Illinois, March 29, 1918, taken by the writer alongside the Illinois Central Railroad just north of the depot, [Illinois]. *Allotype.*—♂; Urbana, Illinois, Cottonwood Grove, April 16, 1915, (J. R. Malloch). *Paratypes.*—Two specimens, same data as type; one specimen, Dane County, Wisconsin, April 10, 1900, (W. S. Marshall); Champaign, Illinois, March 29, 1919, (T. H. Frison).

PROSALPIA Pokorny

This genus is not synonymous with *Eriphia;* the latter belongs to the subfamily Phaoniinae. Both of the American species known to me, and also *arcuata* Walker, are distinguished from

their allies by having two very long, strong bristles on the hind tibia beyond the middle, one on the antero-dorsal and the other on the postero-dorsal surface. The eyes of the females are not more widely separated as a rule than are those of the male.

Prosalpia angustitarsis sp. n.

Male.—Black, slightly shining, with dense yellowish brown pruinescence. Head black, orbits, face and cheeks with silvery pruinescence, interfrontalia opaque, sometimes reddish. Thorax with two narrow shining black vittae, which are fused with the broad lateral pair, giving the thorax the appearance of being bivittate. Abdomen with a linear black dorso-central vitta; hypopygium glossy black. Legs black. Wings clear, conspicuously yellow at bases. Calyptrae and halteres yellow.

Eyes separated by about the width across posterior ocelli; orbits narrow, not obliterating interfrontalia, the former with long bristles on lower half, the latter with a pair of long cruciate bristles; parafacial at base of antennae much wider than third antennal joint, very much narrowed below; cheek about as high as widest part of parafacial, armed with long bristles along lower margin; antennae not extending to mouth-margin, third joint narrowed in middle, about 1.5 as long as second; arista pubescent, with a very short basal swelling. Presutural acrostichals irregularly two-rowed, two or three pairs of moderate length; prealar bristle very long; sternopleurals 2:3. Abdomen about as long as head and thorax combined, cylindrical; hypopygium small, rounded, basal segments distinct; fifth sternite with broad, apically rounded, knife-shaped processes, which have some very minute hairs along the basal half of their inner margins and are otherwise bare, except for a few bristly hairs on the outer third of their surfaces. Fore tibia with one or two short antero-dorsal and one very long posterior median bristle; mid and hind femora with stout bristles on antero- and postero-ventral surfaces; mid tibia with one antero-dorsal, one postero-dorsal and one or two posterior bristles; hind tibia with one anterior, one posterior, two antero-dorsal and two postero-dorsal bristles. Outer cross-vein nearly straight.

Female.—Similar in color to the male.

Eyes separated by about twice the width across posterior ocelli; fore tarsi not broadened; hind tibia usually with an additional antero-ventral bristle; abdomen checkered on dorsum, pointed at apex.

Length, 7.5 to 9 mm.

Type.—♀; Machias, Maine, July 22, 1909, [B. S. N. H.]. *Allotype.*—♂; topotypical. *Paratypes.*—One male, Echo Lake, Mt. Desert, Maine, July 17, 1918; one male, Southwest Harbor, Maine, July 13, 1918; female, Machias, Maine, July 22, 1909; female, Boisdale, Cape Breton, Nova Scotia, July 18 to 19.

Type and allotype are in the collection of the Boston Society of Natural History, male and female paratypes are in the collec-

tion of the Illinois Natural History Survey, a male paratype is in the collection of The Academy of Natural Sciences of Philadelphia; last female specimen in the collection of the American Museum of Natural History.

All except the last specimen were taken by Mr. C. W. Johnson.

The female of this species differs from any other in the genus known to me in having the fore tarsi slender.

Hammomyia marylandica sp. n.

Male.—Black, subopaque, densely gray pruinescent. Thorax rather indistinctly trivittate. Abdomen with a complete dorsal vitta, and a dark area on each side of each tergite anteriorly. Tibiae reddish, the fore pair darker.

Eyes separated at narrowest part of frons by about twice the width across posterior ocelli; each orbit with four or five weak bristles; interfrontalia with a very weak pair of cruciate bristles in front of anterior ocellus; antennae about three-fourths as long as face, third joint over twice as long as second; arista about one-fourth longer than antenna, densely short-haired, the longest hairs a little longer than its basal diameter; parafacial much wider than third antennal joint and two-thirds as wide as height of cheek. Thorax with the presutural acrostichals two-rowed; prealar bristle absent. Fifth sternite with much shorter processes than in *paludis*. Fore tibia with one or two median posterior bristles; fore tarsus longer than fore tibia; mid tibia with one antero-dorsal, one postero-dorsal and two or three posterior bristles; hind femur with the antero-ventral bristles more widely spaced than in *paludis*, the postero-ventral surface with a few median bristles; hind tibia with three or four antero-ventral, antero-dorsal, postero-dorsal and posterior bristles, the latter short. Length, 6 to 7 mm.

Type.—♂; Beltsville, Maryland, May 13, 1917, (W. L. McAtee). *Paratypes.*—1 ♂, topotypical; one male, Mt. Washington, New Hampshire, 3840 feet, August 6, 1909, (W. Reiff).

The type was returned to the collector.

The distinctly haired arista, much more widely separated eyes and longer processes of fifth sternite serve to separate this species from *paludis*, to which it is most nearly related.

Pogonomyza proboscidalis sp. n.

Similar in color to that of *spinosissima* Malloch, the antennae entirely black.

Male.—Differs from that species in having the fifth abdominal sternite with much longer, more widely separated hairs on lower margin, the legs much stouter and shorter, with the mid femora conspicuously thicker than in *spinosissima*, the fore tibia with two bristles, one antero-dorsal, one posterior, the mid femur without the antero-ventral bristles, the hind femur with the

postero-ventral series of bristles nearly entire and stronger, and the costal thorns unequal in length.

Female.—Similar to the male in color, the abdomen unmarked.

Frons about one-third the head-width, each orbit about one-third as wide as interfrontalia, with five to seven bristles in the usual arrangement, the small setulose hairs absent or present only on upper third; cruciate bristles normally present, strong. Abdomen ovate, with strong apical bristles on all segments and discal bristles on segments two to four; genitalia without thorns. Legs as in male except that the hind tibiae lack the posterior bristly hairs.

Length, 3.5 to 6 mm.

Type.—♂; Swarthmore, Delaware County, Pennsylvania, May 21, 1905, [A. N. S. P., Type no. 6232]. *Allotype.*—♀; topotypical. *Paratypes.*—♂ and ♀, same data; ♀, same locality, May 27, 1905; 1 ♀, Swarthmore, Pennsylvania, June 22, 1907; 1 ♀, same locality, May 28, 1907; 1 ♀, same locality, June 4, 1905.

Hylemyia innocua sp. n.

Male.—Similar in color to *setifer* (cf.), the thorax less distinctly pruinescent and the abdomen with a black suffusion on anterior third of each tergite.

Head as in *setifer*, the parafacials at base of antennae narrower than third antennal joint. Thorax with one long and two or three pairs of short presutural acrostichals; prealar about one-third as long as the bristle behind it. Abdomen slightly depressed, narrow, tapered apically; hypopygium normal, superior forceps with five or six very long bristles on each side, inferior pair long and slender; fifth sternite with a blunt-tipped bristle as in *gracilipes* (fig. 31). Fore tibia as in *gracilipes*; fore tarsus compressed, subequal in length to tibia; mid tibia with armature as in *gracilipes*; mid tarsus much shorter than tibia, the basal joint usually with a few long setulose hairs on dorsum; hind femur with a series of bristles on antero-ventral surface, which are very short at one-third from base and become gradually longer to apex; hind tibia with three or four antero-ventral, about eight irregular antero-dorsal and three postero-dorsal bristles, the posterior surface with a few setulose hairs on basal half; claws and pulvilli of mid and hind tarsi much shorter than those of fore pair. Costal thorn small; veins three and four convergent apically.

Female.—More densely gray pruinescent than male. Interfrontalia largely reddish. Thorax not vittate. Abdomen with a dorso-central vitta and lateral reflections blackish.

Tibial armature as in male, but the bristles all stronger, especially the one on the antero-dorsal surface of the mid tibia; apical posterior bristle on fore tibia pointed. Costal thorn and setulae longer than in male.

Length, 4 to 5 mm.

Type.—♂; New Bedford, Massachusetts, (Hough). *Allotype.*—♀; topotypical. *Paratypes.*—Five males and one female,

topotypical; one male, Lewisport, Newfoundland, July to August 1905, (L. P. Gratacap); one male and two females, Godbout, Quebec, Canada, July 25, 1918, (E. M. Walker).

Type in the collection of the Illinois Natural History Survey; paratypes are in the collections of the Academy of Natural Sciences of Philadelphia, Boston Society of Natural History, Canadian National Collection, and the American Museum of Natural History.

This species belongs to the same group of species as *fuscipes* Zetterstedt and is not closely related to *gracilipes*, though possessing the same form of apical bristle on fore tibia, and for this reason placed with it in this paper.

Hylemyia gracilipes sp. n.

Male.—Black, subopaque, densely gray pruinescent. Head black, anterior margin of frons and parafacial at base of antennae usually reddish; palpi fuscous. Thorax not distinctly vittate. Abdomen with a narrow dorsocentral black vitta. Legs pitchy black, knees and usually the tibiae paler. Wings clear, veins yellowish.

Eyes separated by a little more than width of anterior ocellus; parafacial at base of antenna as wide as third antennal joint, slightly narrowed below; cheek a little less than twice as high as width of parafacial, with a series of bristles along lower margin; arista with its longest hairs about twice as long as its basal diameter. Presutural acrostichals two-rowed, one pair usually longer than the others; prealar absent or minute; sternopleurals 1:2. Abdomen slender, depressed; hypopygium of moderate size, the inferior forceps very long, not very slender, flattened apically; fifth sternite as in *angusta* Stein (see fig. 31). Legs slender; fore tibia with a posterior median bristle and a long, curved, blunt-tipped apical bristle on posterior side; mid tibia with one or two postero-dorsal and posterior bristles; mid tarsus with the apical bristle on posterior side of segments two to four longer than normal; hind femur with five or six short, widely-spaced bristles on apical three-fourths of antero-ventral surface, postero-ventral surface unarmed; hind tibia usually with three bristles on antero-ventral, antero-dorsal and postero-dorsal surfaces. Wings rather narrow, slightly pointed; costal thorn small but distinct. Length, 5 to 6 mm.

Type.—♂; Lima, Montana, July 1, 1913, [Mont. Exp. Sta.]. *Paratypes.*—Four males, topotypical; one male, Armstead, Montana, July 3, 1913.

This species is very closely related to *angusta* Stein, but the latter has the apical half of the posterior surface of fore femur densely covered with short, stiff, decumbent hairs, while *gracilipes* has the hairs sparse and erect.

Hylemyia attenuata sp. n.

Male.—Black, slightly shining, covered with dense grayish pruinescence. Head black, orbits, face and cheeks with whitish pruinescence. Dorsum of thorax faintly trivittate. Abdomen with a black streak in middle and lateral checkerings of same color on dorsum of each segment, one spot on each side at base of each segment appearing brown in certain lights. Legs black. Wings grayish, the veins black. Calyptrae white, fringes black. Halteres yellow.

Eyes separated by less than width across posterior ocelli; parafacial wider than third antennal joint and over half as wide as height of cheek, the latter with a few long marginal bristles, three of which are directed upwards; arista apparently bare except under a high magnification. One long bristle on the presutural acrostichal area; prealar bristle minute. Abdomen very slender, the segments, except the apical one, longer than broad; hypopygium small; fifth sternite sparsely bristled. Fore tibia with one median posterior bristle, the apical blunt bristle short; fore tarsus compressed, subequal in length to tibia; mid femur with two or three bristles at base on antero-ventral surface and six or seven on basal half of postero-ventral surface; mid tibia with two or three posterior bristles; mid tarsus shorter than tibia, with long setulose hairs on dorsal surface of basal joint, the next three joints dilated, each with a stout, curved, sharp-pointed bristle at apex on posterior side, which is longer than the joint upon which it is situated; hind femur with a series of moderately long bristles from near base to apex on antero-ventral surface, the postero-ventral surface with a series of short hairs; hind tibia with three or four antero-ventral, three or four antero-dorsal and three long postero-dorsal bristles, the posterior surface with six or seven short setulose hairs above middle; hind tarsus subequal in length to tibia. Costal thorns minute; outer cross-vein nearly straight; veins three and four slightly convergent. Length, 5.75 mm.

Type.—♂; Claremont, California, (Baker), [Illinois].

Hylemyia megacephala sp. n.

Male.—Black, slightly shining, densely gray pruinescent. Head black, orbits, parafacial and cheeks with white, almost silvery pruinescence, face less conspicuously pruinescent; interfrontalia when seen from above opaque black; antennae and palpi black. Thoracic dorsum with a narrow brown stripe along bases of acrostichals on anterior half, on each side of which, in front of suture, is a narrow fuscous vitta, and between the dorso-centrals and the intra-alars there is a broad, rather indistinct, interrupted fuscous vitta. Abdomen with a narrow uniform black dorso-central vitta, the anterior margins of segments very narrowly blackened; hypopygium pruinescent. Legs black. Wings very slightly brownish, the outer cross-vein slightly clouded. Calyptrae and halteres whitish yellow.

Eyes at narrowest part of frons separated by over twice the width across posterior ocelli; orbits almost linear above, broadeneng below, the interfrontalia therefore almost uniform in width, each orbit with five incurved

bristles, the surface otherwise almost bare; frons at base of antennae very decidedly protuberant, the parafacial about twice as wide at that point as at lower margin of eye; antennae large, extending almost to mouth-margin, third joint broad, at least twice as long as second; arista subnude, with an elongate swelling at base, second joint almost twice as long as thick; cheek about one-sixth as high as eye, the lower margin with two or three series of bristles, the upper one posteriorly and the upper and lower at anterior margin of eye being upwardly curved; vibrissa strong, four or five strong bristles below it and a number of strong setulae parallel to the series, several of them above level of vibrissa; proboscis stout and short. Thorax with five or six pairs of very closely placed setulae in the acrostichal series in front of suture; prealar bristle over half as long as the one behind it; sternopleurals 2:2. Abdomen subcylindrical; hypopygium small; fifth sternite with the processes short, each with a distinct rounded swelling on the inner side at middle, the inner margin of which is glossy and apparently chitinized, apices of processes rounded, their surfaces with short, moderately dense hairs. Fore femur with short setulose hairs on antero-ventral surface, without strong bristles; fore tibia with one antero-dorsal, two postero-dorsal and two postero-ventral bristles; fore tarsus distinctly longer than fore tibia; mid femur with one or two bristles on antero-ventral surface at or beyond middle and four or five at middle on postero-ventral surface; mid tibia with one antero-dorsal, two postero-dorsal and three or four postero-ventral bristles, the latter weak; hind femur with a complete series of moderately long bristles on antero-ventral surface, four or five on middle third, and one near tip on postero-ventral surface; hind tibia with from five to seven bristles of irregular lengths on antero-dorsal surface, three or four on postero-dorsal surface, a series of from five to seven short bristles on antero-ventral surface, and from three to six setulose hairs on basal half of posterior surface. Costal thorns small, veins three and four subparallel, outer cross-vein slightly curved.

Female.—Similar in color to the male; the dorso-central vitta on abdomen, however, is slightly tapered from anterior to posterior margin on each segment.

Frons a little over one-third of the head-width, orbits wider than in the male, each in addition to the five infraorbitals with three supraorbitals, the anterior one, and sometimes the second, directed forward; cruciate bristles absent, the triangle as in the male, not extending to middle of interfrontalia. Abdomen tapered apically, the apical segment without thorns. Otherwise as in male except that the tarsal claws and pulvilli are much shorter.

Length, 7 to 7.5 mm.

Type.—♂; Swarthmore, Pennsylvania, May 5, 1907, [A. N. S. P., Type no. 6233]. *Allotype.*—♀; same locality, May 6, 1906. *Paratypes.*—Females, topotypical, June 18, 1905; one male and one female, Auburndale, Massachusetts, May 22.

This species differs from any in the genus, so far described from this country, in the shape of the head and fifth abdominal sternite and in armature of the fore tibia.

Hylemyia bicruciata sp. n.

Male.—Differs from the preceding species in having the thorax and abdomen less densely pruinescent, the former without a brown vitta on center, and the latter with a much broader, tapered dorso-central vitta; the wings are also more noticeably brownish.

The head is somewhat similar to that of *megacephala*, but the frons is not so noticeably protuberant; the orbits have more numerous and weaker bristles, and there are some interspersed weak hairs present; there are two pairs of cruciate bristles on the interfrontalia, the upper pair weak, the antennae are short, the third joint being about 1.5 as long as second, the arista has a very short basal swelling, and the second joint is not longer than broad, the cheek has longer but weaker bristles, especially behind the vibrissa, and the proboscis is thinner. The thorax has on the acrostichal region in front of suture three or four pairs of long, slender, moderately widely separated bristles and a number of interspersed hairs; prealar bristle over half as long as the one behind it, sternopleurals 2:2. Abdomen cylindrical, but little tapered apically, hypopygium protuberant on venter, rounded; fourth sternite very broad, with a fringe of long bristles along each lateral margin; fifth sternite with large processes, which are bare except on upper, or outer, third of their surfaces, the lower edge sharp, knife-like, the apices broadly rounded. Fore tibia with two or three bristles, one or two antero-dorsal and one posterior; fore tarsus decidedly longer than fore tibia; mid femur with a series of long bristles on basal two-thirds of antero- and postero-ventral surfaces; mid tibia with one antero-dorsal, two postero-dorsal and two posterior bristles; hind femur with bristles as in *megacephala*, hind tibia with from four to five bristles of irregular lengths on antero-dorsal surface, three strong bristles and three or four interspersed long setulose hairs on postero-dorsal surface, and two or three bristles on antero-ventral surface, the posterior surface without distinct armature. Costal thorns very small; third vein ending almost exactly in wing tip, fourth subparallel with third, but ending much behind wing tip; outer cross-vein slightly curved. Length, 7.5 mm.

Type.—♂; Great Caribou Island, Labrador, July 27, 1906, [Illinois].

Hylemyia inaequalis sp. n.

Male.—Black, densely gray-pruinose. Antennae black; palpi fuscous, slightly paler at bases. Thorax with a narrow central brown vitta, and a broad poorly defined one on each side along the line of dorso-centrals. Abdomen with base of each dorsal segment indistinctly blackened and the center with a broad black vitta. Legs black. Wings very noticeably paler. Calyptrae and halteres yellow.

Eyes separated by width across posterior ocelli; parafacial in profile as broad as third antennal joint at base of antennae, slightly narrowed below; third antennal joint slightly tapered to apex; arista with longest hairs as long as its basal diameter; cheek a little over one-fourth as high as eye, the lower margin with a few bristles, some of which are directed slightly upward;

proboscis not noticeably thicker than normal. Thorax with one to two pairs of well-developed presutural acrostichals; prealar bristle distinctly over half as long as the one behind it; sternopleura with three bristles. Third ventral abdominal segment armed with longer decumbent bristles on its disc than are any of the other segments; second dorsal segment slightly elongated; hypopygium small; fifth ventral segment with a few long bristles on outer half of each process up to apex. Fore tibia with one antero-dorsal and two postero-ventral bristles; tarsus slender, longer than tibia; mid femur with three to five long postero-ventral bristles; mid tibia with one antero-dorsal, one postero-dorsal and two posterior bristles; hind femur without strong postero-ventral bristles, the antero-ventral surface with four to seven bristles on apical half; hind tibia with two to four antero-dorsal and three or four postero-dorsal bristles, the antero-ventral surface with two to five short setulae, and the postero-ventral surface with five to seven weaker setulae. Costal thorns both moderately long; veins three and four subparallel, outer cross-vein nearly straight. Length, 5 to 6 mm.

Type.—♂; Oregon, Illinois, June 19, 1917. *Paratypes.*—Males; same locality, June 19 and 20, 1917, (J. R. Malloch). Type and paratype in the collection of the Illinois State Natural History Survey; paratype in the collection of the Academy of Natural Sciences of Philadelphia.

This species differs from *linearis* Stein in having two posterior fore tibial bristles, and no anterior bristle on mid tibia in addition to the antero-dorsal one; in other respects the species agree closely.

Hylemyia occidentalis sp. n.

Male.—Black, shining. Frontal triangle, facial orbits and cheeks reddish brown; orbits overlaid with silvery pile; palpi black, antennae black; arista black on the basal swollen portion, remainder yellowish. Thorax with whitish pruinescence on disc, when viewed from behind more or less distinctly quinque-vittate. Abdomen with a broad irregular dorso-central black stripe; hypopygium slightly pruinose. Legs black. Wings slightly infuscated on anterior half. Calyptrae white. Halteres yellow.

Eyes narrowly separated above, interfrontalia obliterated at narrowest part of frons; triangle large; facial orbits in profile protruded as far as width of third antennal joint; cheek nearly twice as wide as orbit in profile; marginal bristles numerous and strong, curving upward but not invading cheek except along margin; face straight, mouth-margin not much protruded; antennae of moderate length, third joint 1.5 as long as second; arista swollen for a short distance at base, minutely pubescent; palpi long, slightly dilated, hairy. Acrostichals long, three or four pairs proximad of suture; prealar bristle over half as long as supra-alar. Abdomen slender, slightly tapered to apex, segments broader than long, hypopygium large, protruding ventrally;

fifth ventral segment with slender processes which are armed with long bristles on their entire length. All tarsi compressed, the fore pair noticeably so; fore tibia with one posterior bristle; mid tibia with one anterior, two postero-dorsal and two postero-ventral bristles; hind femur bare on postero-ventral surface, bristled from base to apex on antero-ventral surface; hind tibia with three antero-ventral, six or seven unequal antero-dorsal, three strong and two or three weak postero-dorsal, and usually two or three weak posterior bristles. Costal thorn about as long as inner cross-vein; last section of fourth vein 1.75 as long as preceding section.

Female.—Differs from the male in having the frons one-third the width of head, interfrontalia with strong cruciate bristles, thorax and abdomen less bristly and more distinctly pruinescent, the thorax rather distinctly trivittate, the mid tibia with a bristle on the antero-ventral surface below the anterior one, the costa distinctly setulose and the costal thorn longer. Length, 5 mm.

Type.—♂; Washington State, April 4 to 20, 1893, (Kincaid), [Illinois].

Resembles *muscaria* Fabricius, but differs in antennal structure and in chaetotaxy.

Hylemyia setifer sp. n.

Male.—Black, shining, densely grayish pruinescent. Head entirely black, or with the anterior margin of frons and part of the parafacials reddish; orbits, face and cheeks with white pruinescence. Thorax with three faint brown vittae. Abdomen with a subtriangular black spot on dorsum of each segment. Legs black.

Eyes separated by about width between posterior ocelli; arista with its longest hairs about twice as long as its basal diameter; parafacial as wide at base of antennae as width of third antennal joint. Presutural acrostichals two-rowed, irregular; prealar bristle small. Abdomen narrow, depressed; hypopygium of moderate size, inferior forceps slender, rather long; fifth sternite with numerous long unequal bristles. Fore tibia with one or two posterior median bristles, the apex without any bristle on posterior side; fore tarsus longer than tibia; mid tibia with or without a small antero-ventral setula, with an antero-dorsal bristle, and two postero-dorsal and posterior bristles; hind femur with a series of closely placed bristles on antero-ventral surface, the longest bristles at middle, and a series of shorter bristles on basal half of postero-ventral surface; hind tibia with about six antero-ventral, four antero-dorsal and three postero-dorsal bristles, the posterior surface with an almost complete series of setulose hairs. Costal thorn long, costal setulae a little longer than diameter of costal vein. Length, 5 to 6 mm.

Type.—♂; Grant, Colorado, 10,000 feet, July 20, 1916, (E. G. Jackson). *Paratypes.*—One male from each of the following: Bozeman, Montana, June 26, 1915; July 23, 1914, July 9, 1917;

Gallatin County, Montana, July 21, 1917; Hot Springs, Montana, July 3, 1917; Tennessee Pass, Colorado, July 23, (J. M. Aldrich).

Type is in the collection of the U. S. Bureau of Biological Survey.

Hylemyia bicaudata sp. n.

Male.—Black, covered with dense drab gray pruinescence. Head black, orbits, face and cheeks with dense white pruinescence. Thorax without distinct dorsal vittae, the lateral margins broadly gray pruinose. Dorsum of abdomen with a broad black opaque triangle on each segment; hypopygium distinctly shining; fifth ventral segment glossy. Legs black. Wings slightly grayish. Calyptrae white. Halteres whitish yellow.

Eyes separated by about the distance between posterior ocelli, the space very much broadened anteriorly; parafacial in profile equal in width to width of third antennal joint and over half as wide as height of cheek; antennae short, third joint but little longer than second; arista almost bare, very much swollen at base. Dorsum of thorax almost devoid of short hairs; post humeral bristle duplicated; presutural acrostichals moderately strong, irregularly two-rowed; prealar bristle usually present, weak, less than half as long as the bristle behind it. Abdomen depressed, the segments subequal, with long, rather sparse dorsal hairs; apex of abdomen swollen, the fourth visible dorsal segment extending down over sides and overlapping fifth sternite, the latter glossy black, with the posterior lateral angles extended, each armed with a pencil of black, downwardly directed bristles. Fore femur unarmed on antero-ventral surface; fore tibia unarmed at middle; fore tarsus noticeably compressed, almost equal in length to fore tibia; mid femur with a few antero- and postero-ventral bristles on basal half, the latter much the longer; mid tibia with one postero-dorsal bristle near apex; hind femur with a complete series of long, rather widely separated bristles on antero-ventral surface, those on postero-ventral surface much shorter and weaker, confined to basal half; hind tibia with two to four postero-dorsal bristles, antero-dorsal surface with two to four setulae, antero-ventral surface with or without one or two very short setulae. Third and fourth veins very slightly convergent apically; costa slightly thickened at apex of first vein.

Female.—Differs from the male in having the interfrontalia reddish and the abdomen unmarked.

Frons slightly over one-third of the head-width; each orbit half as wide as interfrontalia. Legs similar to those of male, differing in having an antero-dorsal bristle on mid tibia and usually two on the postero-dorsal surface, and the postero-ventral surface of the hind tibia bare. The costa is more noticeably swollen than in the male.

Length, 2.75 to 3.5 mm.

Type.—♂; Grand Tower, Illinois, April 21, 1914, on bank of Mississippi River, (J. R. Malloch), [Illinois]. *Allotype.*—♀; Widewater, Virginia, April 2, 1916, on flowers of *Salix tristis*,

(W. L. McAtee). *Paratypes.*—One male, same data as type; four males and one female, same data as allotype; five males, Vienna, Virginia, April 18, 1915, on flowers of *Salix tristis*, (W. L. McAtee); one male and one female, Lafayette, Indiana, April 23, 1917, (J. M. Aldrich); one male, Algonquin, Illinois.

This is the smallest species of the genus known to me from this country. The fourth tergite sometimes covers the bristles on the fifth sternite to such an extent that they do not show very clearly, while in some specimens the tergite does not compress the sternite and the bristles then form a short series on each side.

Preoccupied and Synonymic Names

In my recent paper on Southwestern Diptera[2] I inadvertently used two preoccupied names in the genus *Hylemyia*. I now propose to change those names as follows:

Hylemyia spinidens n. n. for *spinilamellata* Malloch, nec Stein.

Hylemyia anthracodes n. n. for *anthracina* Malloch, nec Czerny.

The following name changes also must be made:

Hoplogaster californica n. n. for *Coenosia parvisquama* Malloch.[3]

Xenaricia Malloch[4] is a synonym of *Hebecnema* Schnabl, (1889).

[1] Proc. Wash. Acad. Sci., ii, p. 444.

[2] Trans. Amer. Ent. Soc., xliv, p. 312 and 314, 1918.

[3] Proc. Calif. Acad. Sci., (4), ix, p. 304, 1919.

[4] Trans. Amer. Ent. Soc., xliv, p. 272, 1918.

Explanation of Plates

Plate IV

Fig. 1.—*Helina lysinoe*. Male hypopygium, one side, dorsal view.
Fig. 2.—*Helina lysinoe*. Fifth sternite, apex only.
Fig. 3.—*Mydaea persimilis*. Same view as number 1.
Fig. 4.—*Mydaea persimilis*. Same view as number 2.
Fig. 5.—*Hebecnema vespertina*. Same view as number 1.
Fig. 6.—*Hebecnema vespertina*. Same view as number 2.
Fig. 7.—*Trichopticus spiniger*. Male hypopygium, one side, dorsal view of superior forceps and apex of inferior forceps.
Fig. 8.—*Trichopticus spiniger*. Fifth sternite, apex only.
Fig. 9.—*Trichopticus conformis*. Male hypopygium, lateral view.
Fig. 10.—*Trichopticus conformis*. Male hypopygium, dorsal view, one side.
Fig. 11.—*Trichopticus conformis*. Fifth sternite, apex only.
Fig. 12.—*Limnophora velutina*. Hind tibia, apex, posterior view.
Fig. 13.—*Limnophora narona*. Hind tibia, apex, posterior view.
Fig. 14.—*Hylemyia antiqua*. Prosternum.
Fig. 15.—*Helina lysinoe*. Prosternum.
Fig. 16.—*Limnophora narona*. Prosternum.
Fig. 17.—*Eulimnophora arcuata*. Same view as number 7.
Fig. 18.—*Eulimnophora arcuata*. Same view as number 8.
Fig. 19.—*Limnophora tetrachaeta*. Same view as number 7.
Fig. 20.—*Limnophora tetrachaeta*. Same view as number 8.
Fig. 21.—*Limnophora velutina*. Same view as number 7.
Fig. 22.—*Limnophora velutina*. Same view as number 8.
Fig. 23.—*Limnophora extensa*. Same view as number 7.
Fig. 24.—*Limnophora extensa*. Same view as number 8.
Fig. 25.—*Limnophora angulata*. Same view as number 7.
Fig. 26.—*Limnophora angulata*. Same view as number 8.
Fig. 27.—*Limnophora narona*. Same view as number 7.
Fig. 28.—*Limnophora narona*. Same view as number 8.

Plate V

Fig. 29.—*Xenomydaea buccata*. Head of male, lateral view.
Fig. 30.—*Limnophora obsoleta*. Head of male, lateral view.
Fig. 31.—*Hylemyia gracilipes*. Fifth sternite of male.
Fig. 32.—*Limnophora extensa*. Head of male, lateral view.
Fig. 33.—*Limnophora alticola*. Head of male, lateral view.
Fig. 34.—*Coenosia rufitibia*. Head of male, lateral view.
Fig. 35.—*Limnophora pearyi*. Head of male, lateral view.
Fig. 36.—*Limnophora clivicola*. Head of male, lateral view.
Fig. 37.—*Coenosia flavicoxa*. Head of male, lateral view.
Fig. 38.—*Limnophora angulata*. Head of male, lateral view.

Fig. 39.—*Limnophora torreyae.* Head of male, lateral view.
Fig. 40.—*Pegomyia unguiculata.* Fifth sternite, one process, from inner side.
Fig. 41.—*Coenosia denticornis.* Head of male, lateral view.

Plate VI

Fig. 42.—*Coenosia hypopygialis.* Abdomen of male, lateral view.
Fig. 43.—*Coenosia ovata.* Abdomen of male, lateral view.
Fig. 44.—*Coenosia errans.* Abdomen of male, lateral view.
Fig. 45.—*Coenosia nivea* var. *brunnescens.* Apex of male abdomen, lateral view.
Fig. 46.—*Coenosia lata.* Abdomen of male, lateral view.
Fig. 47.—*Coenosia antennalis.* Abdomen of male, lateral view.
Fig. 48.—*Xenocoenosia calopyga.* Abdomen of male, lateral view.
Fig. 49.—*Coenosia compressa.* Abdomen of male, lateral view.
Fig. 50.—*Coenosia dichaeta.* Abdomen of male, lateral view.

REVISIONARY STUDIES IN THE GENUS ARENIVAGA

(ORTHOPTERA, BLATTIDAE, POLYPHAGINAE)

BY MORGAN HEBARD

Since our treatment of this genus in "The Blattidae of North America, North of the Mexican Boundary",[1] material of a new Floridian species received by Mr. A. N. Caudell for the National Museum caused him to examine the material of the genus belonging to that institution, which had been studied and reported on by us. That author, recognizing constant male genitalic features of difference in the material we had identified as *apacha*, separated his series of the undescribed type, and described the two new species, which he therefore had before him, as *floridensis* and *genitalis*.[2]

In order to separate our series of the superficially similar species, *genitalis* and *apacha*, we have re-examined closely the material in the Philadelphia Collections and, carrying this analytical examination further than was done in the preparation of our monograph, we find that superficially similar, though distinct, species were also included by us both under *erratica* and under *rehni*.

Such radical changes as the above, from assignments as recent as those given in our monograph, are much regretted by us, but seeing that we were seriously in error, we are most anxious to admit this and present what we believe to be a correct analysis of the species of *Arenivaga*.[3] We feel that in the other genera of the Polyphaginae, as well as elsewhere throughout the North American species monographed by us, the nomenclature is on a stable footing.

[1] Mem. Am. Ent. Soc., 2, pp. 223–239, (1917).

[2] Proc. Ent. Soc. Washington, xx, pp. 154–157, (1918).

[3] The Polyphaginae was the first subfamily studied in our monographic treatment, and for the first time the concealed genitalia of the male had been used for specific diagnostic purposes. After much more intimate knowledge of these features, gleaned from the study of the Blattidae of both temperate and tropical North America, we can readily see that originally fear of going too far and of too great heterodoxy caused us to make the mistakes in question.

All of the species of *Arenivaga* are subject to unusual individual variation. The two specimens recorded by us from the states of Morelos and Guerrero, Mexico, as *rehni*, we believe will probably be found to represent a distinct species. Until further material can be examined from that region, however, we do not feel able to diagnose these individuals properly. We were influenced in our originally too conservative attitude by the fact that as many features, usually constant in the Blattidae, were subject to considerable variation in the genus, we hesitated to use certain male genitalic differences as bases for further specific division. The fact that females of two of the already recognized species were most difficult to separate gave us further reason for caution. It is unfortunate that females of all the species excepting *bolliana* and *floridensis* are so difficult to separate. It is hoped that the constant addition of material will eventually make it possible to ascertain features of difference, by which this sex can also be determined definitely for all of the species. Due to their distribution, females of *rehni*, *floridensis* and *tonkawa* can be determined from locality alone.[4] The problem of determining females of *grata*, *erratica*, *apacha* and *genitalis* is, however, most difficult.

In addition to assigning correctly the material previously recorded, and discussing the important features of the species now recognized, we have recorded in the present paper the few additional specimens subsequently added to the Philadelphia Collections or received by us for study. In preparing the present paper the three hundred and fifty-one specimens of *Arenivaga* in the Philadelphia Collections, as well as a number of individuals sent us for study, have been examined.

Key to Males of the Species of Arenivaga,[5] *based on the Concealed Genitalia:*[6]

[4] Though the distribution of *tonkawa* is largely coincident with that of *bolliana*, the distinctive features of females of the latter species prevent confusion between these.

[5] So much individual variation occurs in the species of this genus, in the features normally used for specific separation, that we feel it is imperative for the student to examine the concealed genitalia of all males to be recorded. The other features which we consider of some diagnostic value, and the degrees of variation known, are discussed under the species.

A. Sinistral genital hook strongly recurved distad to the acute apex.

B. Dextro-ventral genital plate rotundato-quadrate, not showing deep emargination. Dextro-dorsal genital plate small, but with sinistro-distal portion produced and lobate.

C. Surface of dextro-ventral genital plate concave, distal margin very broadly and conspicuously shagreenous.....1. **bolliana** (Saussure)

CC. Surface of dextro-ventral genital plate weakly concave, distal margin very narrowly and weakly roughened or smooth.
2. **rehni** Hebard

BB. Dextro-ventral genital plate cleft to near base dextrad, the sinistral portion rotundato-rectangulate and longer than broad, the distal margins smooth, the dextral portion a stout chitinous rounded projection, which curves sinistrad, with apex touching the dextral margin of the sinistral portion mesad. Dextro-dorsal genital plate relatively very small, narrowly transverse, with exposed surface rounded.
3. **grata** new species

AA. Sinistral genital hook barbed distad, like a fish-hook, and in consequence slightly thicker above the barb than in median portion of shaft.

B. Dextro-ventral genital plate without projections.

C. Dextro-dorsal genital plate small and sausage-shaped, with ventral surface concave and in consequence separated a uniform and considerable distance from the dextro-ventral genital plate. (Dextro-ventral genital plate small, with margins rounded and surface smooth.).....4. **floridensis** Caudell

CC. Dextro-dorsal genital plate with ventral surface not concave and partially in contact with dextro-ventral genital plate.

D. Dextro-ventral genital plate vertically broad, with margins rounded and surface smooth.....5. **erratica** Rehn

[6] The intricate character of the dextral genital plates is by no means fully characterized in this key. We here attempt to describe only those portions which are visible when the subgenital plate has been removed. These, we believe, are quite sufficient for specific determination. The portions of these plates which are concealed when in normal position, will afford an interesting subject when detailed studies of the genitalia are made, but should not be added to the diagnoses, already intricate, necessary for purely systematic purposes. In our dissections we have found that the dextro-dorsal genital plate is always produced in a long narrow curving process which, directed ventrad along the dextral wall of the anal chamber, connects with the dextro-ventral plate near its basal portion dextrad. Moreover the dextro-dorsal plate is, at least in some species, produced inward from its sinistro-basal portion (see plate VII, figures 15 to 17), while in others the dextro-ventral plate has an appendage sinistrad, which, while usually concealed, must not be mistaken for an abnormality when visible (see plate VII, figure 7A).

DD. Dextro-ventral genital plate vertically narrow, broadly and roundly angulate-emarginate to near its base sinistrad of median point, the dextral portion thus formed a small smooth rounded lobe, the sinistral portion an irregularly rounded angulate projection of equal height..... 6. **tonkawa** new species

BB. Dextro-ventral genital plate with productions. (Dextro-dorsal genital plate large and lobiform, but with sinistral margin concave and subchitinous.)[7]

C. Dextro-ventral genital plate armed sinistro-distad with a moderately elongate, slightly curved, heavy spike, directed meso-distad. 7. **apacha** (Saussure)

CC. Dextro-ventral genital plate armed meso-distad with an elongate, straight, heavy spike, adjacent to which sinistrad is a chitinous process of equal length, which is enlarged distad, with apex rounded, and bears on the meso-distal portion of the dextral margin a minute tooth.....8. **genitalis** Caudell

Key to Females of the Species of Arenivaga[8]

(Head remarkably different from that of male, transverse clypeal swelling of face deep. Ocelli minute. Body covered with minute hairs; longer hairs along the margin, particularly cephalad. Tegmina and wings absent. Subgenital plate broadly convex in general form, without a sulcus or any decided production meso-distad. Cephalic femora with ventro-cephalic margin hairy proximad, succeeded in distal half by a row of rather closely-set, short, chaetiform spines.)

A. Form suborbicular. Size large to medium. (General color blackish. Cephalic margin of pronotum often rather narrowly buff, the caudal margin of this marking brace-shaped.) Central Texas. 1. **bolliana** (Saussure)

AA. Form narrower, broad oval to oval. Size medium to rather small.

B. General color blackish. (Cephalic margin of pronotum rather broadly reddish yellow.) Greatest width of body more nearly mesad. Central-western Florida.....4. **floridensis** Caudell

[7] In *apacha* this plate is produced inward from its sinistro-distal portion in an elongate heavy spike, the internal margin beyond the base of this spike armed with two small teeth (see plate VII, figure 15).

In *genitalis* this plate is produced inward from its sinistro-distal portion in a heavy, chitinous, rounded process, the dorsal surface of which is shagreenous, bearing on its dextral margin two small but heavy teeth (see plate VII, figures 16 and 17). These portions, as they are directed inward, are normally concealed and can not be seen without dissection of portions of the concealed genitalia.

[8] As we have stated elsewhere, great difficulty in determining females of some of the species of this genus is experienced. At the present time the female sex of *genitalis* has not been recognized.

BB. General color reddish brown. (Cephalic margin of pronotum usually rather narrowly paler.)

C. Limbs more elongate and slender.

D. Pronotum with a small, weakly defined, triangular, yellowish suffusion on each side cephalad. Interocular space slightly narrower than that between the ocelli. Extreme southern Arizona, Coahuila.....3. **grata** new species

DD. Pronotum narrowly pale cephalad. Interocular space slightly broader than that between the ocelli.

E. Lower California.....2. **rehni** Hebard

EE. Southwestern States east to Pecos River in Texas; Sonora. 5. **erratica** Rehn

EEE. Central Texas, east of Pecos River...6. **tonkawa** new species

CC. Limbs shorter and stouter. (Segments of abdomen normally immaculate.) Arizona, southern California, Chihuahua, Sonora. 7. **apacha** (Saussure)

Though we are now satisfied with the status of at least all of the species found in the United States, we can state definitely that the present genus is easily the most difficult of the genera of Blattidae found in this country.

Arenivaga bolliana (Saussure) (Plate VII, figures 1 and 13)

1893. [*Homocogamia*] *bolliana* Saussure, Rev. Suisse Zool., i, fasc. 2, p. 298. [♂, Texas.]

1904. *Homocogamia bolliana* variety *nigricans* Caudell, Mus. Brooklyn Inst. Arts and Sci., Bull. i, p. 107. [♂; Esperanza Ranch, Brownsville, Texas.]

1917. *Arenivaga bolliana* Hebard, Mem. Am. Ent. Soc., 2, p. 223, pl. ix, figs. 3 to 5. [♂, ♀; Dallas, Waco, Bosque County, Shovel Mountain in Burnet County, San Marcos, Victoria, Corpus Christi, Brownsville, Esperanza Ranch near Brownsville, Mission, Ringgold Barracks near Rio Grande, Kerrville, Sabinal, Knippa, Uvalde, Neuces River in Zavalla County, Carrizo Springs, Eagle Pass, Devils River, High Bridge of Pecos River, Texas.]

1918. *Arenivaga bolliana* variety *nigricans* Caudell, Proc. Ent. Soc. Washington, xx, p. 157. (Evidence indicating specific value suggested.)

We have little to add to our remarks on the species given in 1917. We believe that *nigricans* should be unreservedly assigned to synonymy. The Brownsville material before us is decidedly smaller than any other specimens of *bolliana* we have seen and individuals in the series are of the maximum intensive coloration, which we have not found in other material of the genus, though every gradation to the normal type occurs. Careful comparison with typical material of the species shows no feature worthy of nominal recognition of any kind.

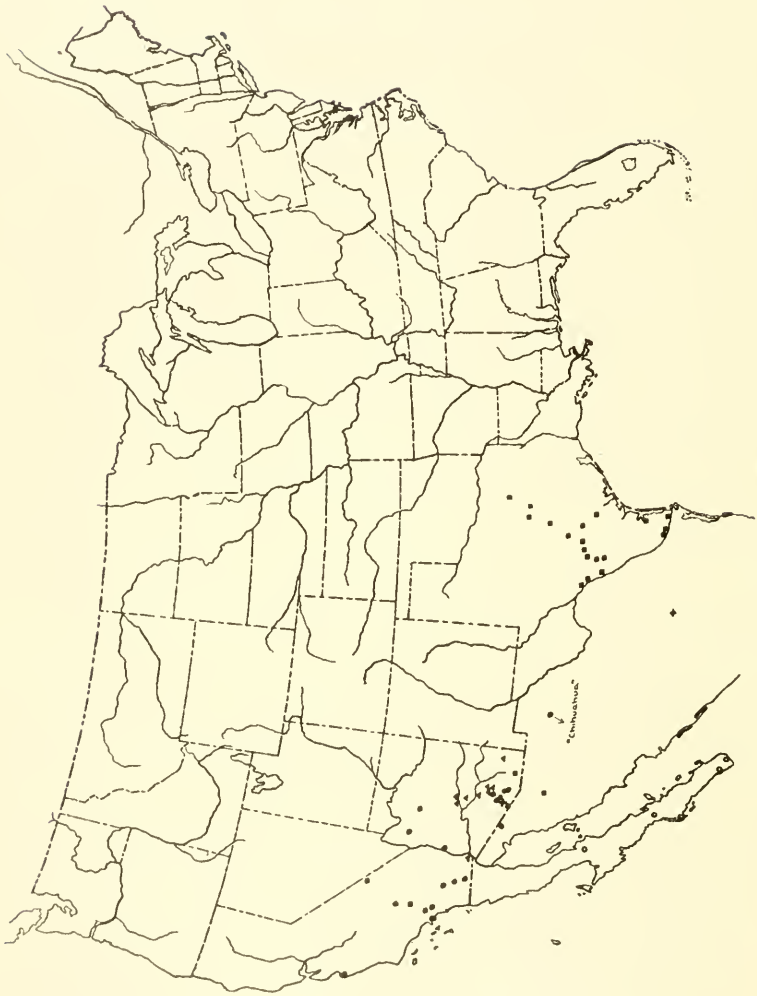


Figure 1—Map showing the known distribution of *Arenivaga bolliana* (Saussure) (by a square), of *Arenivaga grata* new species (by a cross), of *Arenivaga apacha* (Saussure) (by a circle) and of *Arenivaga genitalis* Caudell (by a triangle).

Though normally much the largest species of *Arenivaga*, males are separated with greatest certainty by examination of the concealed genitalia, since some of the males before us from Brownsville, Texas, are even slightly smaller than the males of *grata* here described.

The female sex is readily recognized by its suborbicular form, large size and blackish general coloration. In this sex the interocular space is very slightly narrower than that between the ocelli.

The species is found through central Texas from near the northern border to Brownsville. Its distribution is therefore practically co-extensive with that of *tonkawa* here described. The latter, being a smaller paler species in both sexes, closely related to *erratica* Rehn, is readily separated in both sexes from *bolliana*.

Arenivaga rehni Hebard (Plate VII, figure 2)

1917. *Arenivaga rehni* Hebard, Mem. Am. Ent. Soc., 2, p. 227, pl. ix, figs. 6 to 10. [♂, ♀; San Pedro, Sierra El Tosti, Comondu, San José del Cabo, all Lower California, Mexico.[9]]

From careful examination of the series, we are satisfied that the only material which can be referred definitely to this species is that from Lower California. As our original descriptions of both sexes and all the figures given are from material from that region, we have little further to add at the present time. We would note, however, that, though variable, the present species by no means shows the very great extremes of variation which we supposed existed, when we believed that other Mexican specimens also represented this species.

Arenivaga grata new species (Plate VII, figures 3 and 4)

1917. *Arenivaga rehni* Hebard, (in part), Mem. Am. Ent. Soc., 2, p. 227. [♂, ♀; San Lorenzo, Coahuila, Mexico; Kits Peak Rincon, Baboquivari Mountains, Arizona.]

The present species, with *bolliana* and *rehni*, forms the first group of the genus, which we term the Bolliana Group. The species in this group agree in the type of the concealed sinistral male genital hook, which is sharply recurved distad near its acute apex, not barbed as in the other species.

[9] The material recorded at that time from Arizona and Coahuila is referred in the present paper to *A. grata* here described, while that from Morelos and Guerrero we can not determine with certainty, as stated on page 198.

The dextro-ventral concealed genital plate in males of this species is very distinctive. The species would, however, appear to be nearest in relationship to *rehni*. Compared with females of *rehni*, those of the present species before us are distinguished only by the interocular space being slightly but distinctly greater, instead of slightly but distinctly narrower than that between the minute ocelli. Closer agreement with *bolliana* is suggested merely by the general appearance of males.

Type.—♂; San Lorenzo, Coahuila, Mexico. May. (E. Palmer.) [Hebard Collection, Type no. 530.]

Size medium for the genus, form elongate elliptical. Head with interocular space nearly four-fifths as wide as that between the ocelli.[10] Area from between ocelli to labrum depressed with lateral margins narrowly raised, surface concave between the large projecting ocelli. Pronotum broad, the caudal margin broadly convex, the cephalic margin more strongly convex, the angles formed latero-caudad rather sharply rounded; surface covered with minute hairs, cephalic margin more thickly clothed with longer stouter hairs. Tegmina elongate for the genus, subcoriaceous and glossy, apex well rounded, marginal and scapular fields narrow. Costal margin of tegmina and wings supplied with minute hairs, on the tegmina these become as heavy proximad as on the cephalic margin of the pronotum. Supra-anal plate produced and delicate, bilobate. Cerci small, with joints strongly moniliform meso-distad, tapering to acute apex. Sinistral genital hook very slender, elongate, curving gently inward to near distal extremity, which is sharply recurved inward, very slightly enlarged, with acute apex directed proximad. Dextro-dorsal genital plate very small, narrowly transverse, with exposed surface rounded. Dextro-ventral genital plate cleft to near base dextrad, the sinistral portion rotundato-rectangulate and longer than broad, the distal margins smooth, the dextral portion a stout chitinous rounded projection, which curves sinistrad, with apex touching the dextral margin of the sinistral portion mesad, in such a way that a subcircular open area is enclosed. Subgenital plate bulbous, without styles, hairy toward the asymmetrical and shallowly concavo-emarginate distal margin. Limbs and armament of same as characteristic of the genus. Caudal metatarsus elongate and slender, equalling combined length of succeeding tarsal joints. Tarsal claws elongate and slender. Pulvilli and arolia absent.

Allotype.—♀; same data as type, with no date given. [Hebard Collection.]

Almost identical with females of *rehni*, except for the interocular space, which is slightly but distinctly narrower than that between the minute ocelli, and differently shaped marginal markings of the pronotum cephalad. Very

[10] The Arizona males have this interspace decidedly narrower, only two-fifths as wide as that between the ocelli.

unlike male, apterous, size much larger, form more broadly acute elliptical. Dorsal surface finely roughened, clothed with very short, minute hairs, along the margins these hairs being longer and heavier, particularly in the cephalic half. Pronotum broad, cephalic margin arcuate at an angle of about ninety degrees, caudal margin weakly produced mesad, with sides broadly and weakly concave. Supra-anal plate transverse, weakly trapeziform; caudal margin broadly convex with immediate apex transverse, truncate, showing a very feeble indication of projection at each of the weakly defined, lateral angles thus formed.[11] Limbs with armament differing from that of male as given under key heading, as characteristic of genus.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
San Lorenzo, Coahuila, Mexico, *type*	18.4	5	7[12]	21.6	8.4
Kits Peak Rincon, Arizona	18	5	7.7	23.6	8.6
Kits Peak Rincon, Arizona	18	5	7.8	22.2	8.1

♀				Width of mesonotum	Width of metanotum
San Lorenzo, Coahuila, Mexico, *allotype*	17.7	6.1	8.6	10.3	11.3
San Lorenzo, Coahuila, Mexico, *paratype*	18.8	6.1	8.7	10.8	11.2
San Lorenzo, Coahuila, Mexico, *paratype*	16.8	6	8.4	10	11.1
San Lorenzo, Coahuila, Mexico, *paratype*	16	5.8	8	9.8	10.8

Coloration.—Males. Pronotum bone brown, individually varying to carob brown shading to hazel laterad, excepting cephalic margin which is in all broadly buffy. Tegmina transparent, tinged faintly with buffy brown, with scattered minute transparent flecks of bone brown, which become numerous proximad, clouding heavily the proximal portion of the anal fields, a broad immaculate band running along the humeral trunk proximad in the discoidal field. Head with occiput bone brown, this extending to labrum in type, to antennal sockets in Arizonan males. Other portions of body buffy, with a brownish yellow tinge.

Females. General coloration bay, deepening to liver brown on pronotum, lateral and caudal portions of mesonotum and metanotum and caudad on dorsal abdominal segments. Pronotum with a small, weakly defined, triangular, yellowish suffusion on each side cephalad. Occiput and swollen portion of face above labrum shining bay. Underparts buffy tinged with yellowish brown, the abdomen shining, shading through burnt sienna to bay distad on the slightly less smooth surface of the subgenital plate.

[11] This type occurs also in *rehni*.

[12] The type has been dried from some liquid preservative and the pronotum has in consequence buckled somewhat. In life we believe this diameter was about 7.5 mm.

In addition to the type and allotype, the following material is before us:

San Lorenzo, Coahuila, Mexico, (E. Palmer), 3 ♀, *paratypes*, [Hebard Cln. and A. N. S. P.].

Kits Peak Rincon, Baboquivari Mountains, Arizona, about 4050 feet, viii, 1 to 4, 1916, (Lutz and Rehn), 2 ♂, [A. M. N. H. and A. N. S. P.].

Arenivaga floridensis Caudell (Text figure 2 and plate VII, figure 5)

1908. *Arenivaga floridensis* Caudell, Proc. Ent. Soc. Washington, xx, p. 156. [♂, ♀; Dunedin and Auburndale, Florida.]

This species, remarkable for its broad form, particularly in the male sex, dark coloration and distinctive male concealed genitalia, is the only representative of the genus known from the humid eastern portion of the United States.

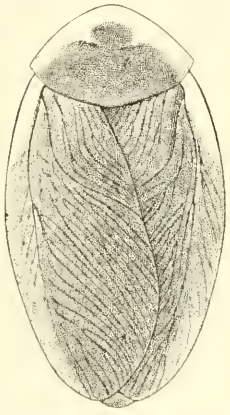


Figure 2. *Arenivaga floridensis* Caudell. Dorsal view of male. Lakeland, Florida. (×3)

In linear arrangement we place it after *grata* here described, and before *erratica* Rehn. This insect is a member of the Erratica Group, the species of which agree in the type of the concealed sinistral male genital hook, which is barbed like a fish-hook distad. To this group belong four other species, of which *tonkawa* is more closely related to *erratica* and *genitalis* to *apacha*.

A single male, taken by Wm. T. Davis at Lakeland, Florida, May 4, 1912, is in the Hebard Collection.[13] Like the type, this specimen is broad, very dark, blackish chestnut brown in general coloration, with space between the eyes barely narrower than that between the ocelli. The distinctive dextral genital plates are here figured for the first time. Length of body, 14.5 mm.; length of pronotum, 4.7; width of pronotum, 7.7; length of tegmen, 15; greatest width of tegmen (meso-distad), 6.6.

The species is known only from the three localities in central-western Florida noted above. It is apparently a spring form, which would account for our not having found the species in the fall, during which season we have done extensive field work in the region from which it is known.

[13] Mr. Davis' great generosity in presenting this fine specimen, which was unique in his own excellent collection, is most deeply appreciated.

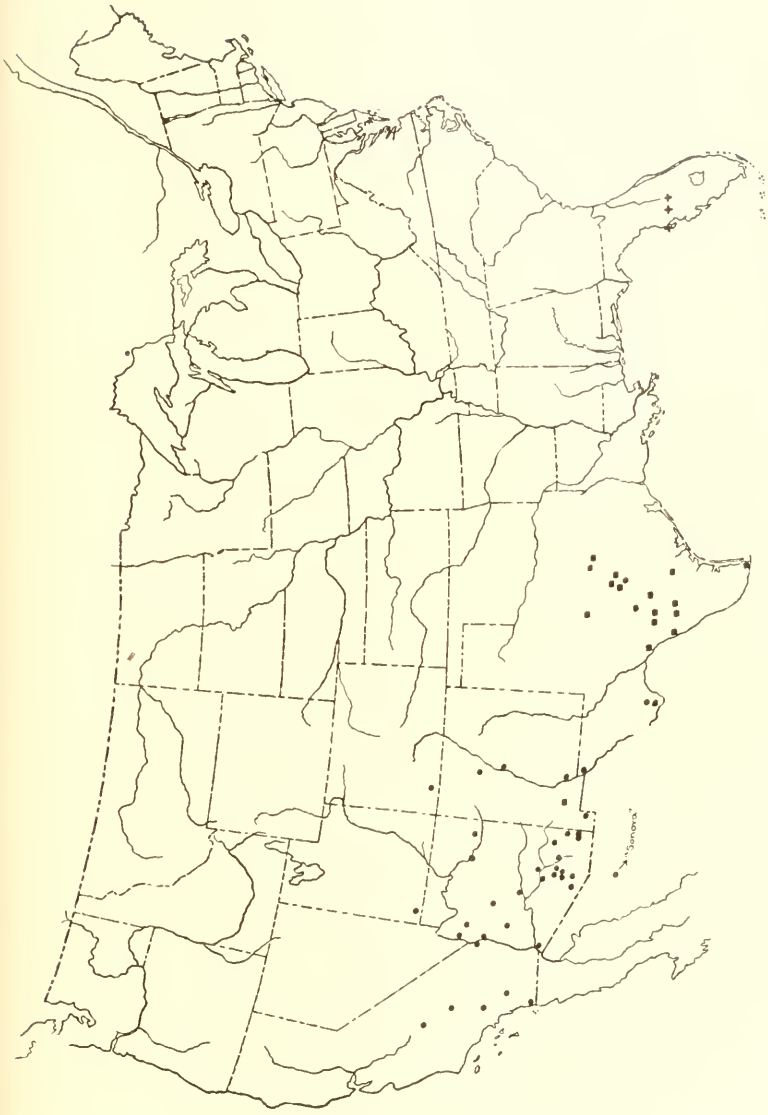


Figure 3—Map showing the known distribution of *Arenivaga floridensis* Caudell (by a cross), of *Arenivaga tonkawa* new species (by a square) and of *Arenivaga erratica* Rehn (by a circle).

Arenivaga erratica Rehn (Plate VII, figures 6, 7 and 14)

1903. *Homocogamia* (*Arenivaga*) *erratica* Rehn, Proc. Acad. Nat. Sci. Phila., 1903, p. 187. [♂; Prescott, Arizona.]

1917. *Arenivaga erratica* Hebard, (in part),[14] Mem. Am. Ent. Soc., 2, p. 231, pl. ix, figs. 11 and 12. [♂, ♀; Hackberry Creek in Brewster County, Chisos Mountains, El Paso, Texas; Durango, Colorado; Mescalero Apache Reservation, Highrolls in Sacramento Mountains, Jemez Hot Springs, Albuquerque, Las Cruces, Deming, New Mexico; Adamana, Winslow, Fort Grant, San Simon, Paradise, Chiricahua Mountains, Roosevelt, Redington, Sheridan Canyon in Huachuca Mountains, Lowell Ranger Station in Pima County, Sabino Basin in Santa Catalina Mountains, Sabino Canyon in Santa Catalina Mountains, Tucson, San Xavier, Snyder's Hill in Pima County, Robles Ranch in Pima County, Palo Alto Ranch in Pima County, Coyote Mountains, Kits Peak Rincon in Baboquivari Mountains, Santa Cruz Village in Cobabi Mountains, Prescott, Florence, Phoenix, Fort Mojave, Yuma, Arizona; St. George, Utah; Cottonwood in San Bernardino County, Riverside, California; Sonora, Mexico.]

1917. *Arenivaga apacha* Hebard, (in part, not of Saussure, 1893), Mem. Am. Ent. Soc., 2, p. 236. [♂; Kern County, Strawberry Valley in San Jacinto Mountains and San Diego, California.][15]

This species is apparently the most numerous and has the widest distribution of the forms of the genus found in the United States.

The following material has been received subsequent to our monographic study:

Sawmill Canyon, Hualapai Mountains, Arizona, VIII, 30 to IX, 22, 1919, (O. C. Poling), 6 ♂, [Hebard Cln.].

Topock, Arizona, X, 9, 1917, (O. C. Poling), 4 ♂, [Hebard Cln.].

Wenden, Yuma County, Arizona, IX, 28, 1913, (Mrs. W. W. Gnash), 1 ♂, [A. M. N. H.].

Needles, California, X, 10, 1919, (O. C. Poling), 1 ♂, [Hebard Cln.].

[14] The material recorded at that time from east of the Pecos River in Texas we find represents a distinct species, which we describe in the present paper as *tonkawa*. The description of the female, as well as the figure given of that sex, apply to that species.

[15] The small size, strikingly maculate pronotum and wide interocular space, led us to mistake the San Diegan specimen for *apacha*, under which species we included material of the then undescribed *genitalis*, the normal type of which species is very similar to the present example in these features. Examination of the concealed genitalia has revealed our mistake. This is an excellent illustration of the absolute necessity to examine the concealed genitalia to determine correctly males of these species. After having become familiar with the very large series we had before us, we, at that time depending on external characters, felt no uncertainty in making this assignment.

The males from Topock, Arizona, and Needles and San Diego, California, are the smallest of any before us and, in addition, differ from the usual type in having the pronotal marking dark and striking, solid caudad with dots and lines cephalad much as in paler examples of *genitalis*. In these the interocular space varies from one-half to four-fifths as wide as the interocellar space, excepting in the San Diegan individual, in which the interocular space is slightly but distinctly wider than that between the ocelli. It is, therefore, clear that, in the regions where the distributions of *erratica, apacha* and *genitalis* coincide, determination of males can be made with safety by relying on the character of the concealed genitalia alone.

The extremes of size variation in males of this species is shown by the following table, as well as an approximately average series from Deming, New Mexico. The species ranges from what we term medium, to very small for the genus.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
San Diego, California.	10.9	3.5	4.7	14.1	5
Topock, Arizona (4)...	11–11.8	3.5–3.8	4.9–5.1	12.7–13.7	4.4–4.9
Deming, New Mexico (11).....	13.3–14.8	3.9–4.2	5.7–6	17.3–18.7	7–7.3
Roosevelt, Arizona....	16	4.9	7.6	19.7	7.8
Sabino Basin, Santa Catalina Mountains, Arizona.....	18	5.3	8.6	21.1	8.9

We find that *erratica* very seldom approaches the minimum or maximum given. In the latter extreme the size approximates that of individuals of the maximum size developed in *tonkawa*, which in that species, however, are apparently of frequent occurrence, particularly in northern Texas.

In males of *erratica* the interocular space is usually about three-fifths as wide as that between the ocelli, but varies from one-half as wide to distinctly wider than that dimension, the latter condition being, however, very rare. In females the interocular space is very slightly greater than that between the ocelli,

Arenivaga tonkawa[16] new species (Plate VII, figures 8 and 9)

1902. *Homocogamia bolliana* Rehn, (not of Saussure, 1893), Trans. Am. Ent. Soc., xxvii, p. 331. [♂; Round Mountain, Texas.]

1903. *Homocogamia bolliana* Rehn, (not of Saussure, 1893), Proc. Acad. Nat. Sci. Phila., 1903, p. 187. [♂; Austin and Round Mountain, Texas.]

1917. *Arenivaga erratica* Hebard, (in part, not of Rehn, 1903), Mem. Am. Ent. Soc., 2, p. 231, pl. ix, fig. 13. [♂, ♀; Waco, Bosque County, Ballinger, Shovel Mountain in Burnet County, Austin, Round Mountain, Georgetown, Goliad, Brownsville, Kerrville, San Antonio, Cotulla, Esperanza Ranch near Brownsville, Sabinal, Knippa, Carrizo Springs, Ringgold Barracks near Rio Grande, Devils River, Texas.]

The present species is very closely related to *erratica*, replacing that species east of the Pecos River in Texas, in which territory it is distributed through the semi-arid area from Waco south to Brownsville.

No indication of intergradation is shown, specimens from the Big Bend region of the Rio Grande being typical of *erratica* and those from east of the Pecos typical of *tonkawa*.

Were either of these species constant in the features usually employed for specific separation, our previous assignment would be reprehensible. We find, however, that in all usually reliable external structural characters a decided amount of variation occurs, *tonkawa* being distinguished readily and, as far as we can see, only, by the distinctive form of the concealed dextroventral genital plate in the male sex. Though some variation occurs in the form of this plate (see plate VII, figures 8 and 9), the general character remains the same and is very distinct from the type developed in *erratica*.

Unfortunately, the greatly simplified female sex appears to have no structural differences by which it can be separated from that sex of *erratica*. No difficulty is experienced in assigning females, however, as this species and *bolliana* are the only forms of the genus *Arenivaga* which occur in Texas east of the Pecos River; females of *bolliana* being readily separated by their suborbicular form, blackish general coloration and average much larger size.

Type.—♂; Carrizo Springs, Dimmit County, Texas. (A. Wadgymar.) [Hebard Collection, Type no. 531.]

[16] The Tonkawa Indians once inhabited the region where this species occurs.

Size medium[17] for the genus, form moderately broad. Head with interocular space three-fifths as wide as that between the ocelli.[18] Area from between ocelli to labrum weakly depressed, transversely wrinkled. Tegmina broader than in *grata* and subcoriaceous, showing very little gloss, as in *erratica*. Other features as described for *grata*, except the concealed genitalia. Concealed sinistral genital hook very slender, elongate, curving gently inward to apex, which is slightly enlarged and barbed like a fish-hook, as is characteristic of the Erratica Group of the genus.

Dextro-dorsal genital plate with ventral surface not concave and partially in contact with dextro-ventral genital plate. Dextro-ventral genital plate vertically narrow, broadly and roundly angulate emarginate to near its base sinistrad of median point, the dextral portion thus formed a small smooth rounded lobe, the sinistral portion an irregularly rounded angulate projection of equal height.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Identical with females of *erratica*, apparently separable only by the fact that the areas of geographic distribution of these two species do not appear to overlap. Very unlike male, apterous, size much larger, form broad ovate. Interocular space slightly broader than that between the ocelli. Dorsal surface rugulose, covered with very short, but stout, minute reddish hairs, these longest along the margins of the body, particularly cephalad. Pronotum moderately broad, cephalic margin evenly arcuate, caudal margin almost transverse, very weakly produced mesad, with sides showing a slight concavity. Each abdominal segment with a dot of darker brown mesolaterad, both above and below.[19] Supra-anal plate transverse, weakly trapeziform; caudal margin weakly convex laterad, with mesal fifth subtruncate, showing an indication of mesal emargination. Subgenital plate very large, roundly produced. Limbs and armament differing from that of male as given under key heading, as characteristic of genus.

[17] Individual size variation is decided in this species. The series from Carrizo Springs varies from the size of the type, which is as large as Brownsville males of *bolliana*, to a size rather small for the genus, this latter being of about the size normal for *erratica*.

[18] Individually variable, in the series at hand ranging from one-third to three-fifths as wide as that between the ocelli, the majority being approximately two-fifths.

[19] This feature is rarely absent in *lon'awa* and *erratica*, rarely present in *apacha*.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
Round Mountain, Texas (3)	15.4–17.5	5.1–5.3	7.7–8	20.3–21	7.5–7.8
Carrizo Springs, Texas, *type*	18	5.7	8.7	22	8.8
Carrizo Springs, Texas, *paratypes* (5)	13.5–16	4.2–5	6–7.3	16.6–18.8	6.3–7.2
Sabinal, Texas	15	5	7.3	18.8	7.2
Brownsville, Texas (9)	14.8–15.3	4.6–4.9	6.4–6.8	16.9–17.6	6.3–6.4

♀				Width of mesonotum	Width of metanotum
Round Mountain, Texas	16	5.4	8.6	11	11.6
Carrizo Springs, Texas, *allotype*	14.4	4.8	7	9.1	9.8
Carrizo Springs, Texas, *paratypes* (3)	13.8–15.3	4.8–5.3	6.8–7.8	8.7–9.7	9.4–10.6
Sabinal, Texas (4)	13.8–14.8	5–5.2	6.7–7.9	8.9–9.5	9.7–10.3

Larger series will, we believe, show even greater size variation, apparently not due to geographic distribution but produced by local environmental influences. Such is true for the related *erratica*, of which species we have much larger series.

General coloration of male ochraceous buff. Pronotum with a light brown shield-shaped marking meso-caudad, usually showing points of darker brown, often with the ground color paling latero-cephalad. In recessive examples this marking is pale yellowish brown, with darker points subobsolete. The tegmina, as in *erratica*, are ochraceous buff, obscurely marbled with a slightly darker shade and showing very little gloss. Head with eyes and occiput to antennal sockets dark brown.

General coloration of female above burnt umber to tawny, the cephalic margin of the pronotum usually vaguely paler. All but the darkest individuals faintly maculate on the pronotum, mesonotum and metanotum with a darker shade. Meso-laterad on each abdominal segment, both above and below, a dot of darker brown is usually present. Covering of minute hairs tawny. Underparts, particularly head and limbs, somewhat paler.

In addition to the type and allotype, five males and three females, bearing the same data, and in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia, are designated paratypes.

No additional material of this species has been received since our monographic study, the ninety-four specimens there recorded as *erratica*, from east of the Pecos River in Texas, being wholly referable to the present species.

Arenivaga apacha (Saussure) (Plate VII, figures 10, 11 and 15)

1893. [*Homoeogamia*] *apacha* Saussure, Rev. Suisse Zool., i, fasc. 2, p. 296. [♂; Chihuahua, Mexico.]

1905. [*Homoeogamia*] *apacha infuscata* Caudell, Proc. U. S. Nat. Mus., xxviii, p. 462. [♂; Phoenix, Arizona.]

1917. *Arenivaga apacha* Hebard, (in part), Mem. Am. Ent. Soc., 2, p. 236, pl. ix, fig. 16. [♂, ♀; Huachuca, Oracle, Tucson, Santa Rita Mountains, Coyote Mountains, Kits Peak Rincon in Baboquivari Mountains, Sycamore Canyon in Baboquivari Mountains, Ehrenberg, Arizona; Death Valley, Monterey, Kern County, Lancaster, Mount Wilson, Claremont, Salton, California; La Sierra de San Francisco, Sonoita, Sonora, Mexico.]

We have noted above the material which we believe to have been correctly recorded as this species in our monograph. Under *apacha* we confused the subsequently described species *genitalis*, as well as three specimens of *erratica*.

We are unable to determine whether any of the females here assigned should be referred to *genitalis*, the female sex of that species apparently being unknown.

We are fully as confident as before that Caudell's varietal name *infuscata* is valueless. That author has recently stated that "in *infuscata* the character, in addition to the blackish general coloration, pointing to at least incipient specific distinction, is the spine of the inferior dextral plate of the concealed genitalia of the male, which is scarcely more than one-half as long as usual in *apacha*."[20] We have examined the series in the Philadelphia Collections, which includes five specimens of the maximum intensive coloration, two are slightly paler but very dark, seven are dark, about as dark as is normal in *genitalis*, while three are pale, quite as pale as normal in *erratica*. We find the length of the spine in question to be individually variable, irrespective of the coloration of the insect. The form of the concealed male genital plates also varies individually to some extent (see plate VII, figures 10 and 11).

In addition to the previously recorded material, we now have before us the following specimens.

[20] Proc. Ent. Soc. Washington, xx, p. 157, (1918).

Sawmill Canyon, Hualapai Mountains, Arizona, IX, 10, 1919, (O. C. Poling), 2 ♂, (maximum intensive coloration), [Hebard Cln.].

Prescott, Arizona, VIII, 20 and 22, 1917, (O. C. Poling), 2 ♂, (maximum intensive coloration), [Hebard Cln.].

La Puerta, Imperial County, California, XI, 1911, 1 ♀, [Cal. Acad. Sci.].

Hermosa, California, (J. O. Martin), 1 ♀, [Hebard Cln.].

We would remark that all of the males now referred to *apacha* are of about the same size as the mean in *erratica*, none being very small, as is normal for *genitalis* and rare, but found to occur, in *erratica* as well.

We regret that the figures of the male genitalia given for *apacha* in our monographic study[21] apply instead to *genitalis*, the spine only of the dextro-ventral concealed genital plate having been drawn while the adjacent clubbed process was omitted. This spine is always smaller and somewhat curved in *apacha*, larger and straight in *genitalis*.

In the series of males before us, the interocular width varies from three-fifths as wide to fully as wide as that between the ocelli, the majority having the former dimension very slightly less than the latter.

As we have previously stated, females of *apacha* agree very closely with those of *erratica*, the difficulty in determining this sex is now augmented by the fact that we have *genitalis* as well to consider, the female of which species apparently is yet unknown. All three of these species have large coincident areas of distribution.

Arenivaga genitalis Caudell (Plate VII, figures 12, 16 and 17)

1903. *Homocogamia apacha* Rehn, (not of Saussure, 1893), Proc. Acad. Nat. Sci. Phila., 1903, p. 188. [♂; Fort Grant, Phoenix and Tempe, Arizona.]

1903. *Homocogamia apacha* Rehn, (not of Saussure, 1893), Ent. News, xiv, p. 327 [♂; Florence, Arizona.]

1917. *Arenivaga apacha* Hebard, (in part not *Homocogamia apacha* Saussure, 1893), Mem. Am. Ent. Soc., 2, p. 236, pl. ix, figs. 14 and 15. [♂: Fort Grant, Catalina Springs, Lowell Ranger Station in Pima County, Sabino Canyon in Santa Catalina Mountains, Phoenix, Tempe, Florence, Arizona; Yuma, California.]

1918. *Arenivaga genitalis* Caudell, Proc. Ent. Soc. Washington, xx, p. 155. [♂; Phoenix, Higley and Catalina Springs, Arizona.]

[21] Mem. Am. Ent. Soc., 2, pl. ix, figures 14 and 15, (1917).

This species averages smallest of the genus, the largest of the twenty-eight males in the Philadelphia Collections being no larger than the smallest of the eighteen males of *apacha* at hand. In size the smallest individuals are approached only by the smallest examples of *erratica*, in which species the greatest size variation occurs.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
Florence, Arizona (12).	10.6–12	3.1–3.9	4.8–5.3	12–13.9	4.8–5.7
Phoenix, Arizona (7)..	10–11.8	3.7–3.9	4.8–5.7	12.7–16.3	5–6.3
Yuma, California.....	11.8	3.9	5.6	14.7	6

The striking features of the dextro-ventral concealed genital plate of the male are described by Caudell. These are figured in the present paper and serve readily to distinguish males of the species. We note that in one specimen the minute tooth at the side of the clubbed process is absent, this being apparently of no diagnostic significance.

The interocular width in the males at hand varies from four-fifths as wide to one and one-fifth times as wide as that between the ocelli. The majority of specimens have these dimensions subequal.

All of the males before us have the dark markings of the pronotum sharply contrasting and the tegminal maculations distinct. The species does not appear to develop a striking intensive type of coloration, such as occurs in *apacha*.

The female sex of *genitalis* is apparently unknown.

Explanation of Figures

Plate VII

All of the figures are greatly enlarged. Though the type is constant, the general form of the dextral concealed male genitalic plates is subject to some individual variation within each species. The character of such individual variation is shown by figures 3 and 4, 6 and 7,[22] 8 and 9, 10 and 11.

Dextral concealed male genitalic plates[23]

Fig. 1—*Arenivaga bolliana* (Saussure). Carrizo Springs, Texas.

Fig. 2—*Arenivaga rehni* Hebard. San José del Cabo, Lower California, Mexico. *Type.*

Fig. 3—*Arenivaga grata* new species. San Lorenzo, Coahuila, Mexico. *Type.*

Fig. 4—*Arenivaga grata* new species. Kits Peak Rincon, Baboquivari Mountains, Arizona.

Fig. 5—*Arenivaga floridensis* Caudell. Lakeland, Florida.

Fig. 6—*Arenivaga erratica* Rehn. Prescott, Arizona. *Paratype.*

Fig. 7—*Arenivaga erratica* Rehn. Fort Grant, Arizona. (See footnote 22.)

Fig. 8—*Arenivaga tonkawa* new species. Carrizo Springs, Texas. *Type.*

Fig. 9—*Arenivaga tonkawa* new species. Carrizo Springs, Texas. *Paratype.*

Fig. 10—*Arenivaga apacha* (Saussure). Santa Rita Mountains, Arizona.

Fig. 11—*Arenivaga apacha* (Saussure). Prescott, Arizona.

Fig. 12—*Arenivaga genitalis* Caudell. Phoenix, Arizona. *Topotype.*

Sinistral concealed male genital hook

Fig. 13—*Arenivaga bolliana* (Saussure). Carrizo Springs, Texas. This type is developed also in *rehni* and *grata*. It is characteristic of the Bolliana Group.

Fig. 14—*Arenivaga erratica* Rehn. Prescott, Arizona. *Paratype.* This type is developed also in *floridensis*, *tonkawa*, *apacha* and *genitalis*. It is characteristic of the Erratica Group.

[22] This figure shows, in addition, the chitinous finger which springs from a point adjacent to the sinistro-basal portion of the dextro-dorsal plate, and is normally concealed by the soft integument which lies sinistrad in the anal chamber. In the specimen figured, as well as in a few others before us, this finger is partially, though not wholly, visible when the subgenital plate has been removed. In three Californian males at hand, however, it is more slender and wholly exposed.

[23] As they appear without further dissection than the removal of the subgenital plate.

Inward production of sinistro-basal portion of dextro-ventral concealed male genitalic plate[24]

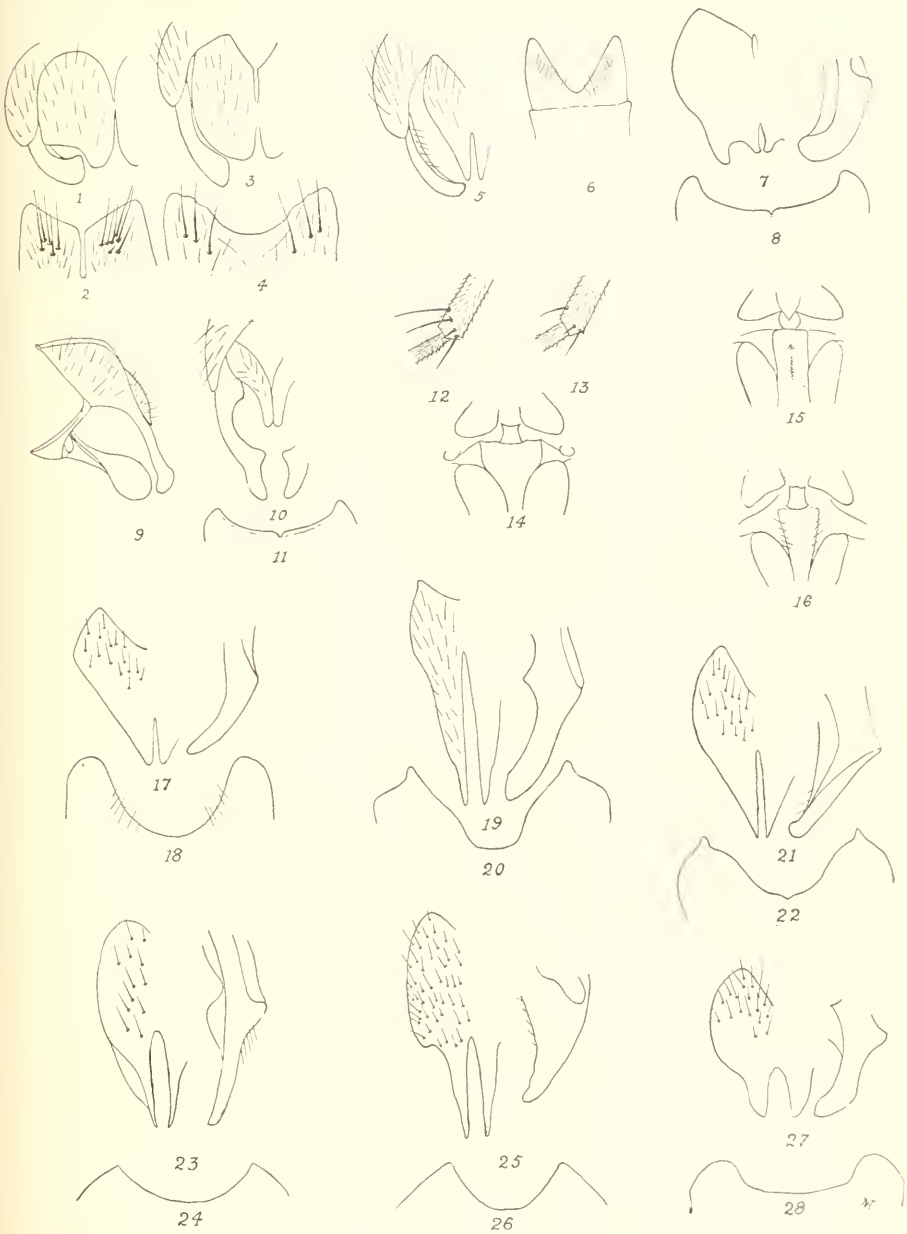
Fig. 15—*Arenivaga apacha* (Saussure). Kits Peak Rincon, Baboquivari Mountains, Arizona.

Fig. 16—*Arenivaga genitalis* Caudell. Lowell Ranger Station, Pima County, Arizona.

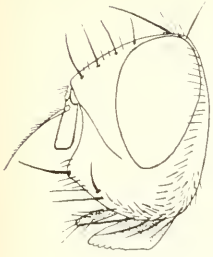
Fig. 17—*Arenivaga genitalis* Caudell. Lowell Ranger Station, Pima County, Arizona.[25]

[24] These portions can not be examined without dissecting out completely the genitalic plates. This we have not done for the majority of species considered, as we feel that sufficient features are revealed by simply removing the subgenital plate and that further injury to the material is unnecessary for specific diagnostic purposes.

[25] This is the obverse aspect of the production shown in figure 16, it is from this side only that we are able to see the teeth, homologous to those shown for *apacha* in figure 15.



MALLOCH—NORTH AMERICAN ANTHOMYIIDAE



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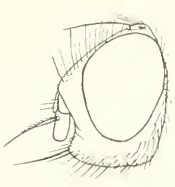

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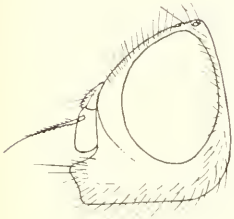

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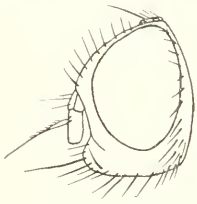

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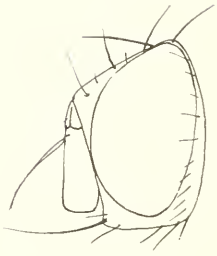

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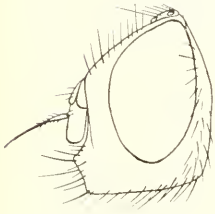

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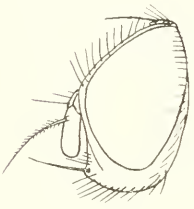

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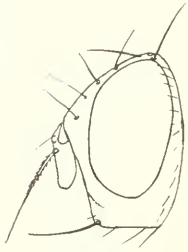

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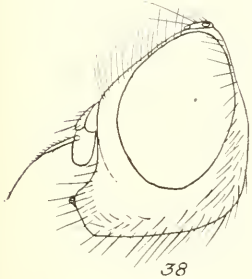

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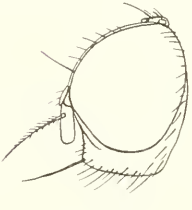

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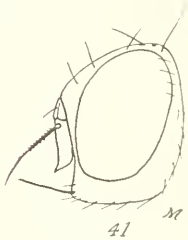

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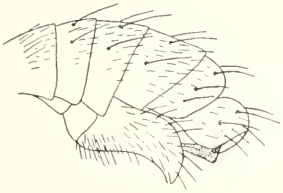
MALLOCH—NORTH AMERICAN ANTHOMYIIDAE



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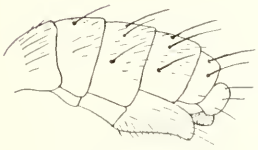

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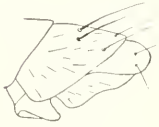

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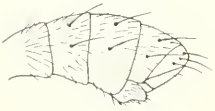

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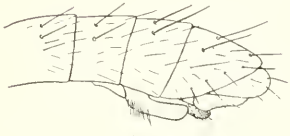

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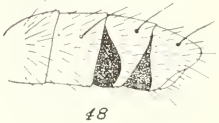

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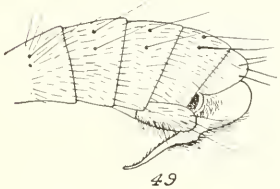

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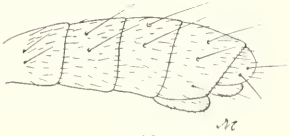

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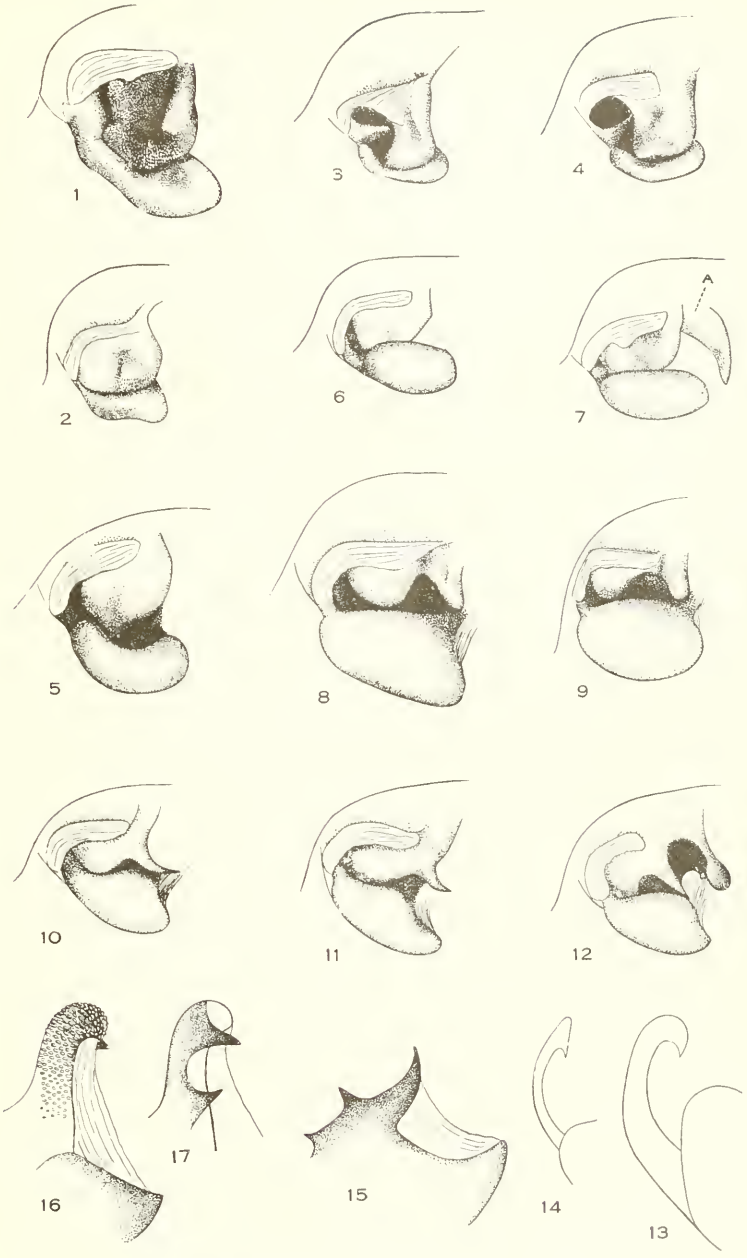

HEBARD—GENUS ARENIVAGA (BLATTIDAE)

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AN ASIATIC SPECIES OF THE DECTICID GENUS ATLANTICUS
(ORTHOPTERA; TETTIGONIIDAE)

BY JAMES A. G. REHN AND MORGAN HEBARD

Recently, while looking over a collection of insects from China, acquired by the American Museum of Natural History, we were greatly surprised to see a female of what was presumably a species of the genus *Atlanticus*. This genus was previously known only from the eastern and central United States and a small adjacent portion of Canada, and on account of a recent study we had made of the species[1] our acquaintance was of more than a superficial character. Through the kindness of Dr. Frank E. Lutz the specimen was placed in our hands for more detailed study, and a critical comparison has been made to determine its true relationship and generic position. The allied Old World genera were examined, when available, or the diagnoses studied, and the result of our investigation confirms our first impression, as the species is a true *Atlanticus*, the first known from the Old World, or for that matter from outside of the area mentioned above.

The species has certain features of distinction which give it a unique position in the genus, such as the great elongation of the distal joint of both pairs of palpi, and the tegmina, in the female sex, extending briefly caudad of the caudal margin of the pronotum. Whether these features are specializations, or whether they are phylogenetic "signboards" indicating the possible ancestral affinities of the genus, we are not prepared to say at present. We now are warranted, however, in pointing to this genus as another member of the already long list of genera common to the biota of eastern China, Japan, and to a certain extent of Formosa, and that of the eastern United States.

In a synoptical arrangement of the genus we would place the species by itself, with the feature of great palpal length as diagnostic. The discovery of the male sex will be awaited with interest.

[1] Trans. Amer. Entom. Soc., xlii, pp. 33 to 99, (1916)

Atlanticus palpalis new species

The species has a unique position in the genus, being distinguishable from all the previously known forms by the much more elongate distal palpal joints, the evident tegmina in the female sex, which project appreciably caudad of the pronotum, and the very regular paginal pattern of the ventral portion of the external face of the caudal femora. Otherwise the new form has most resemblance to *americanus, testaceus, pachymerus, monticola* and *davisi*, more particularly to *pachymerus*. The affinity with *americanus* is evidenced in the general form and proportions, particularly of the fastigium, pronotum and limbs, but the form of the ovipositor and of the subgenital plate are additional features of difference. The relationship with *testaceus* is largely apparent in the ovipositor form, and in a general way that of the subgenital plate, but additional differences are evident in the much more elongate limbs and deeper head, as well as the narrower fastigium. With *davisi*, *pachymerus* and *monticola* we find the closest general affinity, the form of the ovipositor, of the subgenital plate and of the whole insect, except the proportions of the limbs, being much more nearly as in those species. The size is, however, far larger than in any of these and the general characters of difference given above are quite sufficient to enable one readily to recognize the species.

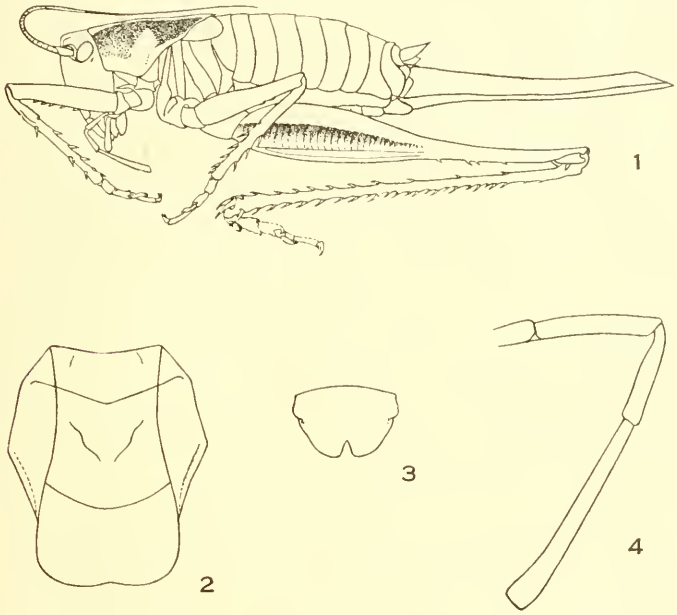
Type.—♀; Yen-ping, Province of Fukien, China. July 12, 1917. [American Museum of Natural History.]

Size large: form elongate fusiform, as usual in the genus, micropterous: surface smooth, moderately polished on face, genae and lateral lobes of pronotum, less so on limbs and ovipositor.

Head well seated in the pronotum, in profile the fastigio-facial angle is rounded rectangulate: fastigium of vertex of medium width, very finely sulcate dorsad, ventrad with margins concavely converging to truncate apex, which is in contact with the fastigium of the face: facial line weakly retreating, face slightly deplanate; width of head across ventral portion of genae greater than width across eyes. Palpi slender, elongate: maxillary palpi with third joint nearly as long as the two proximal joints of cephalic tarsi; fourth joint of same three-fourths as long as third joint, weakly infundibuliform, sharply narrowed proximad; distal joint of same twice as long as third joint, straight except very briefly distad, faintly enlarging distad in proximal two-thirds, distal extremity thickened and subclavate, with a weak flexor bend, the distal margin with a weak oblique truncation; labial palpi with distal joint enlarged similarly to but less decidedly than the distal maxillary palpal

joint. Eyes moderately prominent. Antennae somewhat longer than the body; proximal joint much enlarged, the internal face with a distinct rectangulate projection, when seen in dorso-ventral view.

Pronotum of the general type found in the genus, the dorsum well separated from the lateral lobes by very evident, though narrowly rounded, angles: disk of the pronotum in general flat, nearly one-half as long as the ovipositor and nearly equal to two-fifths of the length of the caudal femora; cephalic width of disk faintly more than two-thirds the greatest width of same, which



Atlanticus palpalis new species. Figure 1. Lateral view of type. (×1⅛.) Figure 2. Dorsal outline of pronotum of type. (×2½.) Figure 3. Subgenital plate of type. (Greatly enlarged.) Figure 4. Maxillary palpus of type. (Greatly enlarged.)

is at caudal fifth; greatest constriction, which is at cephalic fourth, but slightly less than cephalic width; cephalic margin of disk moderately concave; caudal margin of same flattened arcuate, mesad with a very faint concave sinuation: lateral carinae of disk very weakly clepsydral; median carina of disk not evident cephalad, very faintly indicated caudad; metazona about one-half as long as the prozona; cephalic transverse carina at cephalic fifth, very obtuse-angulate. Lateral lobes of pronotum weakly expanding ventrad in transverse section; dorsal length of lobes contained nearly twice in their depth: cephalic margin of lobes weakly oblique truncate, ventro-cephalic angle

rounded obtuse, ventral margin oblique subtruncate, ventro-caudal angle broadly rounded rectangulate, forming the point of greatest depth, caudal margin strongly sinuate oblique, the humeral sinus evident: surface of lobes undulate, weakly impressed in the regions of the transverse sulci, the portion dorsad of the humeral sinuses impressed, vertical. Tegmina lateral, nearly contiguous mesad, largely hidden under the pronotum, normally visible distad of the caudo-lateral portion of the disk and caudal section of the lateral lobes as rather narrow rounded pads, projecting distad of the caudal margin of the disk hardly more than the width of the proximal antennal joint; distal extremity of tegmina faintly truncato-arcuate, the lateral margin regularly arcuate; surface of tegmina with raised anastomosing venation, in which the major veins are differentiable.

Abdomen with the faintest possible indication of a medio-longitudinal ridge and no carina on dorsal surface: disto-dorsal abdominal tergite with a pronounced and broad median depression, which is subvertical in position and sulcate mesad; distal margin of same segment arcuate between cercal bases, but with a marked and broad median emargination, which is obtuse-angulate cephalad and with parallel lateral margins caudad, the caudo-lateral angles sharply rectangulate. Supra-anal plate short, apex slightly more acute than a right angle, surface smooth except for a slight median transverse impression. Cerci about twice as long as exposed portion of supra-anal plate, incrassate in proximal two-thirds, there covered with setiferous papillae, distad sharply tapering to the aciculate apices. Ovipositor about three-fourths as long as the caudal femora, robust, deep, nearly straight, there being the faintest curve in the distal half; proximal fourth relatively inflated, this particularly evident from the dorsum;[2] dorsal and ventral margins gradually converging in proximal two-fifths of ovipositor, thence subparallel to the oblique truncation of the dorsal margin, which is found in the distal eighth; apex ventral, very acute; all margins entire. Subgenital plate broad, moderately transverse, the lateral angles sinuate convergent distad, the apex of the distal margin rather deeply V-emarginate, the angles bounding the same laterad subrectangulate.

Limbs elongate, particularly the caudal pair, rather robust. Cephalic femora but little shorter than the pronotal disk, ventro-cephalic margin with five spines on distal half: cephalic tibiae with foramina rimate, dorso-caudal margin of same with three to four spines, dorso-cephalic margin with no spines. Median femora slightly longer than the cephalic femora, with two to three spines mesad on the ventro-cephalic margin. Caudal femora subequal to the body (exclusive of ovipositor) in length, the proximal two-fifths greatly inflated, the greatest depth contained five and one-half times in the greatest length of the same; distal section of caudal femora slender, subequal, weakly enlarged in genicular region; pattern of the paginae ventrad of the

[2] The left dorsal valve is aborted in the type, being not more than a fourth the length of the right dorsal, but this condition has not distorted or exaggerated any of the characters here given.

median line regularly half "herring-bone," dorsad of the line rather irregularly scutellate proximad, passing to subshagreenous on distal section of inflated portion of the femora: ventro-external margin of caudal femora with three to four spines, ventro-internal margin of caudal femora with six to seven spines. Caudal tibiae with median distal spurs longer than the dorsal or ventral distal spurs, the internal median slightly longer than the external median. Caudal tarsi damaged.

General color between prout's brown and mummy brown, passing to sepia on the genae, pleura and paler portions of the lateral lobes, the caudal femora with a tawny-olive touch and the other femora with a faint dark olive wash. Head with the occiput paling to snuff brown; eyes mottled prout's brown and fuscous; antennae dresden brown proximad, passing to tawny, then distad to dresden brown again. Pronotum with the dark shining sections of the lateral lobes blackish fuscous; no whitish humeral line as usual in the genus. Tegmina mars brown. Ovipositor becoming more chestnut-brown distad. Femoral spines and areas at their bases blackish fuscous; spines of cephalic and median tibiae with areas at their bases infuscate, the spines themselves tawny with darkened tips. Caudal femora with median line of paginae blackish fuscous, this shading away ventrad, but sharply contrasted with the tawny-olive wash of dorsal portion; caudal tibiae vermiculate with fuscous and washed with russet.

Length of body (exclusive of ovipositor), 37 mm.; length of pronotum, 12.3; least width of pronotal disk, 5; greatest width of pronotal disk, 6.8; length of exposed (lateral) portion of tegmen, 4.3; length of cephalic femur, 10.3; length of median femur, 11.6; length of caudal femur, 36; greatest depth of caudal femur, 6.1; length of ovipositor, 28.

The type of this striking and most interesting species is unique.

DESCRIPTIONS OF NEW GENERA AND SPECIES OF NORTH AMERICAN DECTICINAE

(ORTHOPTERA; TETTIGONIIDAE)

BY JAMES A. G. REHN AND MORGAN HEBARD

A critical examination of the large series of North American Decticinae in the Philadelphia Collections, including the material secured by Rehn and Hebard in field work in the western United States in 1909, 1910, 1912 and 1919, as well as a number of series from other sources, has brought to light some interesting novelties. In the present paper we are presenting the descriptions of two new genera and ten new species, reserving until a future time the publication of the information we have secured on the general relationship of the genera and species of the subfamily as found in North America.

Aglaothorax segnis[1] new species. (Pl. VIII, figs. 1 and 3; pl. IX, fig 1.)

Separable from *A. ovatus* by the inflation of the meso- and metazona of the pronotal disk, the median carina of the same being more distinct caudad, the more elongate sub-elliptical pronotal disk, the less evident lateral carinae of the disk, shallower and more elongate lateral lobes of the pronotum, apical instead of preapical tooth on the inter-cercal[2] plates and the somewhat longer and more slender male cerci. From *A. armiger*, here described, it can be distinguished by the rugulose and distinctly carinate pronotal disk, the more evident lateral carinae of the disk, the more inflated pronotal mesozona, the apical tooth on the inter-cercal plates and the longer and more slender male cerci.

No relationship exists with any of the other species which have been referred to the present genus.

[1] *Segnis*—slow and sluggish.

[2] This name is preferable to that of "infra-cercal plates" used by Caudell for the same structures, as their position and homology is better expressed by the term here used.

Type.—♂; Crestline, Lincoln County, Nevada. Elevation, 6000 feet. September 4, 1909. (Rehn and Hebard; in juniper (*Juniperus utahensis*).) [Hebard Collection, Type no. 540.]

Size medium: form robust, micropterous, with pronotum produced and cucullate, much as in *A. ovatus* (the genotype): surface smooth, of pronotum distinctly polished over numerous rugulosities.

Head well seated in the pronotum, short, deep, from cephalic aspect seen to be distinctly inflated in the ventral portion of the genae, the greatest width of the head across genae apparently greater than that across eyes; face in profile weakly convex; occiput arcuate longitudinally and transversely, regularly declivent cephalad to the apex of the fastigium: fastigia of the vertex and of the face not in contact, separated by an interspace which is triangular when seen in profile; fastigium of the vertex with the disto-lateral margins distinct and converging, when seen from the dorsum the apex is broadly blunted; dorsal surface of fastigium with a narrow, sinuate median sulcus; fastigium of the face blunt tuberculate. Eyes moderately prominent; in basal outline short ovoid. Antennae rather heavy, in length somewhat surpassing the body; proximal joint slightly broader than long, decidedly depressed.

Pronotum strongly cucullate and appreciably inflated, considerably developed dorsad of the base of the abdomen, the greatest dorsal length of the pronotum about three-fourths that of the caudal femora. In profile the dorsal outline of the pronotum is weakly concave and subsellate cephalad, distinctly and rather strongly arcuate caudad from the cephalic sulcus; when seen from caudal aspect the disk is appreciably tectate transversely. Disk of pronotum with the mesozona and metazona together ovoid in outline, the broadest point of disk at three-fifths of entire pronotal length, the greatest width contained one and one-half times in the greatest length of the pronotum, the width of disk on prozona about two-fifths of the greatest width of the mesozonal disk: cephalic margin of disk of pronotum subtruncate; caudal margin and caudal portions of lateral margins regularly semi-ovate, the lateral margins obsolete on the prozona, sharply and arcuately developed on the mesozona, thence regularly diverging to the point of greatest width of disk; lateral and caudal margins of disk thickened, substrumose on the mesozona and cephalic section of the metazona, elevated and smooth elsewhere on mesozona: median carina virtually obsolete on the prozona, weakly indicated on the mesozona and distinctly and continuously indicated on the metazona: surface of the mesozona of the disk rugulose, of the metazona arcuately bullate both transversely and longitudinally, the sculpture decided and made up of fine transversely vermiculate rugulae; a weak depressed internal channel borders the lateral carinae of the disk, this becoming more decided and much more evident caudad: transverse sulci distinct, the cephalic alone cutting the carinae. Lateral lobes of the pronotum of the deep type, without distinct humeral sinus indications, characteristic of the genus: greatest depth of lateral lobes at cephalic fifth, contained two and one-half times in the dorsal length of the same: cephalic margin of lobes sinuato-truncate, ventro-cephalic angle broadly rounded, ventral margin sinuate, ascending

caudad, joining the caudal margin of the disk briefly caudad of the point of greatest width of disk; surface of lobes rugulose, the cephalic transverse sulcus deeply impressed dorsad, caudal transverse sulcus evident though less deeply impressed than the cephalic transverse sulcus; ventral margin distinctly and heavily cingulate. Tegmina in normal position completely hidden under the pronotum, of the type usual in the genus, their greatest width faintly greater than their greatest length; sutural margin with the projection at the apex of the sutural vein narrowly rounded rectangulate produced; humeral trunk very robust, strongly and regularly arcuate; stridulating vein straight transverse in the distal two-thirds, distinctly thickened near apex. Prosternum unspined. Mesosternum and metasternum strongly transverse, the lateral lobes hardly produced, broadly rounded; foraminal fossae strongly transverse, rimate.

Abdomen with a very weak medio-longitudinal carination of the dorsal tergites. Supra-anal plate, which is apparently the eleventh tergite and is fused with the tenth tergite proximad, lies between the dorsal ridges of the inter-cereal plates, the lateral margins of the plate weakly converging, nearly straight, distal margin broadly arcuate. Inter-cereal plates[3] strongly developed, weakly arcuate in most of their length, moderately falcate distad; the internal tooth apical, weakly unguiculate; dorso-internal surface of plates concavo-excavate, the dorsal carina sharp. Cerci equal to about one-third the length of the inter-cereal plates, elongate conical, proximal width equal to about one-half of length, distal extremity faintly attenuate. Subgenital plate large, scoop-shaped, subparallel laterad, distal extremity reaching to apices of inter-cereal plates, portion of distal margin between styles bisarcuate, styles represented by small semicircular rudiments.

Cephalic and median femora relatively short, moderately robust, faintly compressed, dorsal surface with a few adpressed spines proximad; ventral margins unspined, except that ventro-cephalic margin of one cephalic femur bears mesad a single spine. Cephalic tibiae with foramina rimate; dorsal margins unarmed except for a single distal spine on the cephalic margin; ventral margins with five to six spines. Median tibiae with three to four spines on the dorsal margins; ventral margins with five to seven spines. Caudal femora somewhat longer than the length of the head and pronotum together, moderately inflated proximad, dorsal surface of inflated section with numerous adpressed spines; ventro-external margin with three to six spines, ventro-internal margin with three to four spines; caudal tibiae no longer than the femora, ventral margins unarmed except for a few very small spines distad; distal spurs a single pair, the internal one appreciably longer than the external one; caudal tarsi short; plantula short, ovate in outline, the internal one the longer, this no more than one-half as long as the metatarsus.

General coloration chamois, faintly tinted with lime green on the pronotum (in life all mottled green), the dorsal abdominal pattern, which is a feature of *Aglaothorax* and *Neduba*, snuff brown, the pale blotches of the

[3] The "infra-cereal plates" of Caudell's paper on the North American Decticinae.

same pattern cinnamon-buff. Dark annulations of antennae, dark markings of pronotal disk and dark patches on caudal femora blackish-fuscous. Head unmarked; eyes snuff brown, occasionally (paratype) blotched with fuscous; antennae with the two proximal joints pale, distad of this dark with pale annuli, the latter becoming fewer distad and distad of the proximal two or three embracing two antennal segments each. Pronotal disk with an irregularly shaped, but symmetrical, median areolate dark marking cephalad, mesad about the median carina is placed a group of irregular lineations: carinal periphery of pronotal disk with paired dark markings as follows: sub-circular blotch at cephalic transverse sulcus; sub-ocelliform blotch at caudal transverse sulcus, this with lineations extending caudad; caudad between points of greatest width with a fairly regular, closely-placed series of distinct blotches. Abdominal dorsum with a pair of distinct pale longitudinal lines, which are sinuate on the individual segments, on the fifth segment developed into a pair of large pale blotches, the whole embrowned dorsum of the abdomen with a regular sprinkling of pale "rain-drop" areolations. Cephalic and median femora each with an irregular preapical annulus of weak fuscous to saccardo's umber, this irregularly defined and with pale areolations, the median femora with traces of a dark proximal infuscation; cephalic tibiae with irregular and incompletely indicated dark annuli distad and at the distal end of the foramina; weak dark annuli distad on the median tibiae. Caudal femora with irregular and incomplete dark annuli pre-apical and disto-median in position, indicated only on the dorsal and lateral surfaces, very irregular in shape and pale areolate; portion of caudal femora proximad of disto-median dark band areolate-nebulose with buckthorn brown dorsad, the dorso-lateral portion of the same section and of the distal section of caudal femora between the dark annuli pale cinnamon-buff; caudal tibiae and ventro-external portion of caudal femora lime green to absinthe green. All tarsi and disto-external portions of tibiae washed with walnut brown, the pads margined with fuscous.

In life the specimens were very much more completely green, approximating the lime green to absinthe green tones remaining on the caudal tibiae and portions of caudal femora.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest width of pronotal disk	Length of cephalic femur	Length of caudal femur
♂, *type*.....	26.3	12.3	8.2	6.4	16.2
♂, *paratype*.....	32[4]	13.3	8.7	6.9	17

In addition to the type we have a paratypic male bearing the same data as the type.

The locality—Crestline—is one of the low points of the Juniper Mountains, which is the name used in the Report of the Death

[4] Abdomen abnormally extended in stuffing.

Valley Expedition for the north and south plateau-like range separating Meadow Valley from the Escalante Desert. Crestline is the point at which the Los Angeles and Salt Lake Railroad crosses this divide, the elevation being approximately 6000 feet. The arborescent vegetation is an open, park-like stand of Utah Juniper (*Juniperus utahensis*) and occasional pinyon; the ground cover is almost entirely sage. The weather was chilly and unsettled when these specimens were collected. The field notes made at the time the specimens of *A. segnis* were taken are so full they are worthy of quotation in their entirety.

"The two decticids were taken in juniper. Both were located on the night of September third by their stridulations, and one was taken with the aid of a flash lamp. This individual was twenty-five feet up in the top needle clusters. Its note was much like that of *Scudderia*, but it was more difficult to locate. When found the insect started slowly to crawl downward and it could not be seized until it had gone down the trunk over a foot. The other individual was located in a juniper about ten feet high and the next morning was found resting in one of the topmost bunches of needles, where its coloration made it almost indistinguishable from its surroundings. When seized it uttered a sharp *tswick-tswick-tswick* over and over again. The song at night could be heard by intent listening at as far away as two hundred feet. Two others were heard. They began to sing as dusk fell and were at their loudest early in the evening, ceasing as the night became cold."

Aglaothorax armiger[5] new species. (Pl. VIII, figs. 2 and 4; pl. IX, figs. 2 and 3.

Separable from *ovatus* and *segnis* by the much smoother and less rugulose pronotal disk and the very weak lateral production of the lateral carinae of the pronotal disk. From *ovatus* it also differs in having the pronotal disk more elongate in proportion to the width, and in the lateral lobes of the pronotum being more shallow and more elongate caudad. From *segnis* it also differs in having the median carina of the pronotal disk subobsolete, the mesozona of same less inflated, the tooth on the inter-cercal plates pre-apical instead of apical and in the male cerci being shorter and broader.

[5] *Armiger*—bearing a shield, in allusion to the pronotal disk.

No relationship exists with any of the other species which have been referred to the present genus.

Type.— ♂; Lee Canyon, Spring Mountains, Clark County, Nevada. Elevation, 6000 feet. August 18 to 21, 1919. (Rehn and Hebard; in tree yucca (*Clistoyucca brevifolia*). [Hebard Collection, Type no. 541.]

Size and form much as in *A. segnis:* surface similar but pronotum smoother and less rugulose.

Head as in *A. segnis* but less inflated ventrad on the genae, the greatest width of the head across genae very slightly greater than that across eyes, the outline of genae from cephalic aspect moderately arcuate, instead of appreciably diverging ventrad, as in *A. segnis:* interspace between the fastigia of the vertex and of the face broader and shallower than in *A. segnis,* when seen in profile: fastigium of the face very low and very blunt.

Pronotum with greatest dorsal length about three-fourths of the length of the caudal femora. In profile the dorsal outline of the pronotum is nearly straight cephalad, moderately arcuate-decurved caudad; when seen from caudal aspect distinctly arcuate transversely on disk. Disk of pronotum with the mesozona and metazona elliptic-ovate in outline, the broadest point of disk very faintly caudad of middle of same, the greatest width contained one and two-thirds times in the greatest length of pronotum, the width of disk on prozona about three-fifths of the greatest width of same on mesozona: cephalic margin of disk of pronotum subtruncate; caudal and distal portions of lateral margins of disk semi-ovate, the lateral margins obsolete on the prozona, distinctly and arcuately developed on mesozona, but less sharply so than in *A. segnis,* on metazona less strongly arcuate laterad than in *segnis,* there non-strumose and hardly thickened: median carina obsolete on the prozona, subobsolete on the mesozona and very weakly indicated and not appreciably elevated on the metazona: surface of the disk with microscopic transverse vermiculate etchings, but never the rugulae of *A. segnis,* the internal channel bordering the caudal margin of the disk distinct but shallow, hardly indicated along the lateral margins: transverse sulci as in *A. segnis* but less decided and smoother. Lateral lobes of pronotum of the type found in this genus: greatest depth of lobes at cephalic fifth, contained two and two-thirds times in the dorsal length of the same: cephalic margin of lobes truncate, ventro-cephalic angle obtuse, ventral margin descending in cephalic fifth, there rounded obtuse-angulate, the margin thence obliquely ascending, straight, to the distal fourth, where it is weakly concave: surface of lobes but weakly rugulose, the transverse sulci but weakly impressed, the caudal sulcus not appreciably interrupting or even severing the lateral carinae of the disk. Tegmina as in *segnis.* Sternal parts as described in *A. segnis.*

Abdomen as described for *A. segnis,* with the following differences: supra-anal plate or eleventh tergite, which is apparently fused with the tenth tergite, broader than in *segnis,* the lateral and caudal margins nearly semi-

circularly arcuate. Inter-cereal plates much as in *A. segnis*, but the internal tooth is robust and pre-apical, the apex of the plate blunted. Cerci about one-fourth as long as the inter-cereal plates, short conical, proximal width equal to three-fourths of their length, distal extremity very faintly attenuate.

Cephalic and median femora short, robust, appreciably compressed, dorsal surface with scattered adpressed spines, these usually proximad; ventro-cephalic margins with a single spine, ventro-caudal margins unspined. Cephalic tibiae with foramina rimate; dorsal margins each with a single distal spine, also one spine placed mesad on the dorsal surface faintly distad of the foramina; ventral margins with five to six spines. Median tibiae with three to four spines on the dorsal margins; ventral margins with six to seven spines. Caudal femora somewhat longer than the combined length of the head and pronotum together, moderately inflated proximad, the inflated section dorsad with scattered adpressed spines; ventro-external margin with seven to ten spines, ventro-internal margin with three to four spines distad; caudal tibiae subequal to femora in length, spines and spurs as in *A. segnis*, caudal tarsi as in *segnis*.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Differing from the features of the male (type) description in the following:

Pronotum in profile with the dorsal outline weakly but regularly arcuate, when seen from caudal aspect the disk is less strongly arcuate and more deplanate transversely than in male. Disk of pronotum with greatest width contained one and one-half times in greatest length of same, the width of disk on prozona about one-half of greatest width of mesozonal disk: median carina of pronotal disk more evident than in male, but less evident than in male of *A. segnis*, surface of disk with vermiculate etchings faintly more evident than in male. Lateral lobes of pronotum faintly deeper proportionately than in male, the greatest depth contained two and one-third times in the greatest dorsal length of same: ventral margin of lobes more broadly arcuate cephalad than in male, caudad the same margin is hardly at all concave; lateral carinae of disk appreciably overhanging the dorsal section of the lateral lobes. Tegmina undeveloped.

Abdomen with the production which we assume to be the eleventh tergite, and which is the supra-anal plate, somewhat narrower and more produced trigonal than in the male, the lateral margins straight converging to the acute apex. Inter-cereal plate short, broad, hardly surpassing the apex of the eleventh tergite, meeting ventrad on the median line, rounded distad, completely excavate on their internal faces. Ovipositor heavy, falciform, elongate, in length but slightly shorter than the caudal femora, gently narrowing in proximal half, thence subequal in depth to near the acute apex; dorsal margin of ovipositor with distinct, erect teeth in distal half, ventral margin with shorter, more serrate teeth in distal fifth, series of teeth on disto-ventral margin of dorsal valves less extensive than the regular ventral series. Subgenital plate broad proximad, narrowing distad, there produced into a pair of sub-parallel spiniform fingers, as long as the proximal section of the plate, when the ovipositor is in the usual resting position the fingers lie on each

side of its ventral ridge; interspace between the fingers slightly widening proximad, the bottom of the interspace biconcave.

Coloration much as described in *A. segnis*, the pattern, however, with greater depth and contrast in all but the most recessive type individuals. General pale color of the head, thorax and sides of abdomen ranging from cream-buff in the recessive individuals to honey yellow in the intensive specimens; pale color of the dorsum of the abdomen ranging from cartridge buff to light pinkish cinnamon, the median bar on the dorsum of the abdomen ranging from clay color to russet. Eyes buckthorn brown to chestnut brown. Dark pattern of pronotal disk blackish fuscous; in the recessive type this is limited to a median and paired lateral touches at the cephalic transverse sulcus and a median cloud at the cephalic margin, and spaced maculations about the caudal margin of the same, this augmenting by extension and fusion of the spots, and extension of a center of infuscation at the principal transverse sulcus, until in the intensive condition we have the prozonal portion with a nearly solid blotch, the vicinity of the principal transverse sulcus with three infuscation centers, from which caudad on the metazonal disk irregular lineations extend to the nearly solidly infuscate caudal margin. Lateral lobes of pronotum with the cingulate margin regularly ticked with fuscous, the surface with scattered small substrumose nodes of whitish. Abdomen with the sides weakly washed with fuscous over the pale ground color, which shows through in very numerous areolations, producing a similar but much more evident pattern than the nodules on the lateral lobes of the pronotum. Dark pattern on dorsum of abdomen blackish fuscous, the median bar, described above, areolate much like the sides, the bar occasionally infuscate. Limbs with the markings, as found in *segnis*, infuscate, very evident in all but the most recessive specimens.

One male specimen has the sides of the abdomen and the lateral lobes of the pronotum rather weakly washed with oriental green. This condition is exactly as in nature, while the other specimens in life had no green evident.

Measurements (in millimeters)

	Length of body (exclusive of ovipositor)	Length of pronotum	Greatest width of pronotal disk	Length of cephalic femur	Length of caudal femur	Length of ovipositor
♂, *type*	24.7	12.4	7.2	6.7	17.5	....
♂, *paratype*	22.6	12.3	7.6	6.3	17.2	....
♂, *paratype*	26.5	14 1	8.4	7.3	19.4	....
♀, *allotype*	26.3	14	9.2	8.1	20.8	18.6
♀, *paratype*	24.3	11.7	7.5	6.9	17.7	18.4
♀, *paratype*	24.5	12.7	8.4	7.5	19.6	19.5

In addition to the type and allotype we have before us a paratypic series of fifteen males and sixteen females bearing the same data as the type, and two paratypic males having the same locality and date, but taken at 4000 feet elevation. This series

shows considerable variation in the size of the individuals and in the intensity of the color pattern. The males from four thousand feet elevation, in a distinctly more arid section, subject to more intense heat and light, show the maximum recessive color type, approached to some extent, however, by several males from six thousand feet. The pronotal disk shows some variation in general form in both sexes, being somewhat broader in proportion in some individuals than in others, but in even the broadest specimens we find no confusing approach to *A. ovatus*, while the sculpture shows virtually no variation. In certain females the teeth of the dorsal margin of the ovipositor cover less of the margin than in the allotype. The sulcus of the fastigium of the vertex is more extensive cephalad in some specimens than in others, and in these the fastigium is distinctly emarginate cephalad when seen from the dorsum.

The distal spine on the dorso-cephalic margin of the cephalic tibiae is occasionally absent, as is also the spine near the foramina. The median tibiae occasionally have as few as a single spine on the dorso-cephalic margin. The caudal femora may have as few as three or as many as ten spines on the ventro-external margin, and be from unarmed to having as many as five spines on the ventro-internal margin.

This species is almost entirely restricted to the tree yucca or "Joshua Tree" (*Clistoyucca brevifolia*) belt found on the northeastern slope of the Spring or Charleston Mountains in Clark County, southern Nevada. The tree yucca begins to be scatteringly evident on the slope of the range somewhat below the four thousand foot level, becoming more abundant, predominating the landscape, at about four thousand five hundred feet, and giving way to the junipers and pinyons in the neighborhood of the six thousand foot contour. Our field notes on this species are as follows: "*Aglaothorax* colonies found in joshuas and in one large cedar in their midst. All were found hidden at the base of the dried leaves just below the green leaves, or at the bases of the green leaves themselves. They occurred at heights of from four to eight feet from the ground, but were most abundant at about five to six feet. All were nestled closely to the branch,

as tightly as the bundles of leaves would permit, the sharp 'daggers' forming a protecting barrier. On one sultry afternoon the males were giving a short 'tzick' at very long intervals. The males protestingly and vigorously stridulated when disturbed, not only their characteristic 'tzick' but a 'bzzzz' also. Apparently they are very local, as on one occasion thirty joshuas were thoroughly examined without result, while on two adjacent joshuas, one of which was very small, ten specimens were taken."

Rehnia cerberus[6] new species. (Pl. VIII figs. 5 and 7; pl. IX, figs. 4 and 6.)

Allied to *R. spinosa* Caudell, from southern Texas, but differing in the somewhat smaller size, in the great amount of blackish coloration on the caudal margin of the pronotum, in the generally pronounced brownish color of the abdomen, in the shorter and more recurved male cerci, the basal tooth of which is much less basal in position than in *spinosa*, in the shorter and broader stridulating field of the male tegmina and in the smaller, less recurved protuberance on the seventh sternite in the female. With *spinosa* the present species forms a group well separated from the other components of the genus.

Type.—♂; Marathon, Brewster County, Texas. Elevation, 3900 to 4160 feet. August 26, 1912. (Rehn and Hebard.) [Hebard Collection, Type no. 535.]

Size medium; general form and texture as in *R. spinosa*.

Head short in length but very deep, moderately bullate, width across ventral portion of genae one and one-fifth times that across eyes, in cephalic aspect the lateral margins of the head gently diverge ventrad: face subdeplanate: fastigium strongly compressed, sublamellate, briefly sulcate proximad on dorsal surface, in profile arcuate dorsad, apex obtuse-angulate, not in contact with the subobsolete fastigium of the front. Eyes of medium size, quite prominent, appreciably projecting, semi-globose, short ovate in basal outline. Antennae very slightly more than twice the length of the body, slender.

Pronotum sellate, on the disk elevated cephalad and caudad; cephalic elevation occupying somewhat less than one-sixth of pronotal length, regularly but not strongly ascending cephalad, the elevation extending laterad along the cephalic margin of the pronotum, becoming obsolete on the lateral lobes; caudal elevation a fourth of the pronotal length, decidedly elevated, sharply differentiated cephalad and arcuate bullate in outline, extending transversely between points dorsad of tegminal insertions; profile of pronotum between cephalic and caudal elevations deplanate and straight longitudinally,

[6] *Cerberus*, the three-headed dog at the gates of Tartarus.

regularly arcuate transversely: greatest caudal width of pronotal disk contained one and two-fifths in greatest length of same: all margins of pronotum cingulate, cephalic margin of disk weakly concave mesad; caudal margin of disk weakly arcuate. Lateral lobes of pronotum with greatest dorsal length contained one and two-fifths in greatest dorsal length of same: cephalic margin of lateral lobes oblique sinuato-truncate; ventro-cephalic angle rounded obtuse; ventral margin weakly oblique, ventro-caudal angle (which is the point of greatest depth) broadly rounded obtuse; caudal margin obliquely sinuato-arcuate, indications of humeral sinus and a similar sinuation ventrad on the same margin, weak; surface of the lobes weakly impressed dorso-caudad.

Tegmina in length equal to length of head and twice that of the pronotum together, reaching to the base of the fifth abdominal tergite, of the tegminal length that of the stridulating field occupies half, the proximal half of the tegmina broad, the distal half narrowing appreciably to the apex: costal margin strongly arcuate proximad, very faintly arcuate mesad, distad moderately straight oblique to the bluntly rounded apex; sutural margin straight distad of the stridulating field: mediastine vein distinct but short, sinuate; humeral and discoidal veins fused into a very robust humeral trunk, this distinctly arcuate in proximal half, as slender as and subparallel to the median vein distad; median vein nearly straight, bent slightly before its middle, attenuate; ulnar vein furcate at proximal two-fifths of its length, the costal fork closely approaching the median vein: stridulating field of left tegmen with greatest width contained about one and one-half times in the greatest length of the same, bounded laterad by a very broad external speculum or channel, in which is faintly indicated the anal vein; stridulating vein transverse, arcuate proximad, straight distad, very robust in distal two-thirds, in transverse section rounded dorsad; speculum with greatest length and greatest proximal width subequal: speculum of right tegmen subcircular in outline, transparent: general anastomosing venation well elevated.

Wings but very faintly shorter than the tegmina, when expanded the length along the costal margin is distinctly less than length along the radiate margin, periphery of the radiate field arcuate in a quadrant, weakly sinuate distad, apex of the anterior field bluntly rounded.

Prosternum with the paired spines very elongate, acute, erect; mesosternum with the sternal lobes erect spiniform, these productions hardly shorter than the prosternal spines.

Penultimate abdominal tergite short, transverse, distal margin arcuate obtuse-angulate distad, over cercal bases produced into broadly arcuate lobes, the surface of the tergite at the depth of the median emargination transversely arcuate impressed, this flanked laterad by paired low, but erect, subtrigonal tooth-like projections: antepenultimate tergite smooth. Supra-anal plate small, trigonal, dorsal surface excavate. Cerci relatively short, broad in proximal half, there with surface subdeplanate, along internal margin with an elevated ridge, which becomes more pronounced mesad, then disappears; the internal tooth is situated mesad, deflected and decurved; distal half falciform and tapering, narrowing sharply distad of tooth and thence

caliper-like; apices acute. Subgenital plate ventrad with distinct lateral and a brief median carinae, the lateral pair styliform; distal margin V-emarginate; styles distinct, short, tapering.

Femora with all ventral margins strongly spined, those of the two margins subequal in length; genicular lobes strongly bispinose. Cephalic femora a fourth longer than the combined length of head and pronotum; spines of ventro-cephalic margin six to seven in number, of ventro-caudal margin eight in number: cephalic tibiae with foramina rimate, the spines of ventral surfaces hexacentroid[7] in character, six in number on each margin, the proximal three uniform in length, the distal three decreasing in length; dorso-cephalic margin unspined, dorso-caudal margin with five spines. Median femora slightly shorter than the cephalic femora, ventro-cephalic margin with six spines, ventro-caudal margin with eight to nine spines: median tibiae with six spines on each ventral margin, the spines similar to but shorter than those of the cephalic tibiae; dorso-cephalic margin with four to five spines, dorso-caudal margin with six spines. Caudal femora equal in length to the head, pronotum and tegmina combined, rather slender, appreciably inflated proximad, ventro-external margin with eleven to thirteen spines, ventro-internal margin with eight to ten spines: caudal tibiae slightly longer than the femora, all margins spined; distal spines three paired: caudal tarsi with plantula short and rounded.

Allotype.—♀; same locality as type. September 12 to 13, 1912. (Rehn and Hebard.) [Hebard Collection.]

The features here given are those of difference from the description of the type (♂).

Pronotum slightly narrower than in male, the greatest caudal width of disk contained one and one-third times in the greatest length of the same. Tegmina with the humeral trunk proximad less thickened and less arcuate than in male; sutural margin in general straight, except for the proximal obtuse-angulation.

Penultimate abdominal tergite with the median emargination V-shaped, deep, rounding into the truncate distal margin of the segment, which is not lobate developed over cercal bases; surface of tergite relatively simple: antepenultimate tergite with very weak median carina. Cerci but slightly longer than the supra-anal plate, conical, apex acute, there faintly incurved. Ovipositor slightly longer than the body and one and one-half times as long as the caudal femora, slender, with a very faint ventral bend at proximal two-fifths, proximal portion moderately thickened, more regularly tapering in this section when viewed from the dorsum than when seen in profile; dorsal and ventral margins parallel in distal three-fourths, the dorsal margin in distal tenth obliquely arcuato-truncate to the acute apex, which is ventral in position; margins entire. Subgenital plate rather small, when seen from venter

[7] That is, with spines similar to those found in species of the genus *Hexacentrus*.

subquadrate, the distal margin shallowly emarginate, in profile the caudo-lateral angles of the plate are broadly rounded rectangulate; surface of plate compressed proximad with a distinct lamellato-carination mesad in that region, distad with a median sub-deplanation. Seventh sternite with a decided, conical, non-compressed tubercle, which is weakly hooked caudad.

Cephalic femora with five spines on the ventro-cephalic margin, seven to eight in number on the ventro-caudal margin; cephalic tibiae with four spines on the dorso-caudal margins. Median femora with five to six spines on ventro-cephalic margin and seven spines on ventro-caudal margin. Caudal femora slightly shorter than the combined length of head, pronotum and tegmina, ventro-external margin with ten to eleven spines, ventro-internal margin with eight to nine spines.

The coloration features here given have been taken only from the best preserved specimens.

General coloration of head, thorax, venter and limbs between deep chrysolite green and rainette green (Ridgway), becoming biscay green on the tegminal venation, the face with a weak ochraceous tinge. Eyes russet; antennae with the two proximal segments of the general color, remainder russet paling to buckthorn brown distad, on proximal fifth the russet segments individually are darkened distad, and occasionally the dorsal surface, when the antennae are extended cephalad, is completely blackish infuscate for a considerable distance. Mandibles with their internal face generally washed with bay; clypeus occasionally infuscate distad with bay. Pronotum with entire eingulate margin pencilled with blackish fuscous, except in contact with the pale area on the lateral lobes, where the margin is of the general color, the dark margining of greatest width cephalad on disk: opaque white maculations developed as a rather broad intermarginal bar caudad on the lateral lobes, also as a pair of elongate trigonal spots caudad on the inflated caudal section of the pronotal disk, the apices of which spots are directed toward the median line and are occasionally subcontiguous, but generally well separated by a median fuscous patch, which in the extreme intensive type completely encircles the dorsal white patches, the latter being severed from the lateral patches by a similar dark patch, which in these intensive individuals is connected with the median fuscous patch. In extremely intensive specimens the fuscous extends ventrad along the cephalic margin of the lateral white patch and marks a sharp contrast. Meso- and metapleura each with an opaque white patch, which is also indicated on their respective coxae. Tegmina with the stridulating (♂) or axillary (♀) field largely, and the greater portion of the distal section of the discoidal field with the membranous portion mummy brown to fuscous, the entire venation pencilled over this in biscay green to dull wax yellow, the dark base color in intensive specimens showing through very solidly. Wings with the base color olive-brown to clove brown, the greater portion of the surface with numerous subquadrate patches of pale dull green-yellow, these coalescing about the periphery to form there a nearly solid pale margin, the costal margin and greater portion of the proximal section of the anterior field of the pale color.

Abdomen with its dorsum varying from dresden brown (recessive) to blackish chestnut (intensive), the distal margin of all the tergites narrowly, but in intensively colored specimens strikingly, bordered with between yellow ocher and primuline yellow: cerci weakly washed with the general dorsal abdominal coloration on an ochraceous ground. Ovipositor of the general color, with the apex of the dorsal margin and distal portion of the ventral margin pencilled with fuscous. Femoral spines blackish fuscous; tibial spines black tipped, articulate tibial spines and tibial spurs similarly black tipped, but area at their insertion also infuscate, all tibial spines and spurs, exclusive of the spines of the dorsal margins of the caudal tibiae, each with a longitudinal hair-line of blackish.

Measurements (in millimeters)

	Length of body (exclusive of ovipositor)	Length of pronotum	Greatest caudal width of pronotal disk	Length of tegmen	Length of cephalic femur	Length of caudal femur	Length of ovipositor
♂							
Marathon, *type*.....	35.3	7.5	5.5	17.8	12.9	27	....
Marathon, *paratype*..	33.5	7	5.1	16	12	24.3	....
Marathon, *paratype*..	37.5	8.1	5.6	19.5	13.5	28.8	....
♀							
Marathon, *allotype*..	42.5	8.5	5.8	20.9	15.4	31.7	46.6
Marathon, *paratype*..	33	7	4.7	16.7	12.6	27	44.2
Chisos Mts.[8].....	39.5	9.8	7	22.5	17.8	37.3	50.5

These measurements show that very considerable individual variation in size is present in the species.

In addition to the type and allotype we have before us eight male and six female paratypes, taken at Marathon, Texas, August 26 and 27 and September 12 and 13, 1912, by Rehn and Hebard. We have also one male taken at Hackberry Creek, Boquillas Road, Brewster County, Texas, September 2, 1912, (Rehn and Hebard); one male taken two miles north of Bone Spring, Brewster County, Texas, elevation 2720 feet, September 9, 1912, (Rehn and Hebard); one female taken in the Chisos Mountains, Brewster County, Texas, July, 1911, (H. A. Wenzel), the latter in the collection of the Academy of Natural Sciences of Philadelphia, and three females taken at Jaral, State of Coahuila, Mexico, November 1 to 3, 1909, by J. Friesser and from the collection of the Field Museum. From these records it is evident that the species ranges from the Trans-Pecos region of Texas, south over the north-eastern portion of the Mexican tableland to at least as far as southern Coahuila.

[8] Abdomen somewhat shrunken, the specimen having been dried from liquid preservative.

The coloration of the species varies considerably in depth, distinct recessive and intensive extremes being evident in the series. The ovipositor varies somewhat in form, occasionally having a regular, although gentle, decurvature, instead of a slight bend, as in the allotype.

A critical analysis of the paratypic series shows there is much variation in the spine formulae, a condensed summary of the extremes of which is as follows:

Cephalic femora

Ventro-cephalic margin	Ventro-caudal margin
4–8 (usually 6)	5–8 (usually 8)

Cephalic tibiae

Dorso-caudal margin
3–6 (usually 4)

Median femora

Ventro-cephalic margin	Ventro-caudal margin
5–8 (usually 7)	7–9 (usually 8)

Median tibiae

Dorso-cephalic margin	Dorso-caudal margin
3–5 (usually 4)	4–7 (usually 6)

Caudal femora

Ventro-external margin	Ventro-internal margin
8–14 (usually 11)	7–12 (usually 9)

The spines of the ventral margins of the cephalic and median tibiae are always six in number, except for an accidental mutilation, and the dorso-cephalic margin of the cephalic tibiae is never spined.

At Marathon the species occurred in low acacia or cat's-claw, and in a sweetflowered bush growing with the acacia on the upper slopes of the low hills to the east of the town. All the specimens seen at this locality were taken. At Hackberry Creek a very few were heard along a wash in heavy and high bushes, the specimen taken having been secured, after dark, from a hackberry tree, and at a height of fifteen feet from the ground. The specimen from near Bone Spring was in a clump of mesquite on the edge of a wash and was very wary and difficult to secure. A male was heard, by Rehn and Hebard, at about twenty-five to thirty feet from the ground in the top of a solitary willow tree in a wash, at Neville Spring, Brewster County, Texas, elevation 3290 feet, on September 8, 1912.

The note of this species is much like that of *R. victoriae*, but is much sharper and louder, more like "kazít, kazít, kazít, kazít, kazít."

Rehnia sinaloae new species. (Pl. VIII, figs. 6 and 8; pl. IX, figs. 5 and 7.)

This remarkable insect forms a section of the genus *Rehnia* showing a pronounced tendency toward *Neobarrettia* Rehn, and may require a subgenus for its reception to properly express its isolated position. It is a *Rehnia*, however, as it possesses four distal spurs on the flexor surface of the caudal tibiae, has the pronotal form of the *Rehnia* type and the male genitalia, although strikingly modified, with the same general features found in the other species of the genus.

From the other species of *Rehnia* now known the present form at once can be distinguished by the very short tegmina of the male, which are composed of little more than the complex dorsal stridulating field and a narrow lateral field, the whole no longer than the head and pronotum together; while the elongate and forcipate male cerci are equally distinctive. In the female sex the form of the subgenital plate will be found distinctive, while the tegmina proportionately are as abbreviate as in the male sex. The ovipositor is shorter than in the other species, while the process of the seventh sternite is less developed than in *R. spinosa* and *cerberus*.

Type.—♂; Venvidio, Sinaloa, Mexico. August 14, 1918. (J. A. Kusche.) [Hebard Collection, Type no. 534.]

Size slightly smaller than *R. victoriae;* form similar to that of the other species but with reduced tegmina and wings: surface smooth, of head, thorax and limbs weakly shining.

Head short in cephalo-caudal length, moderately bullate, width across ventral portion of genae one and one-third times that across eyes, in cephalic aspect the lateral margins of head regularly diverge ventrad; face subdeplanate: fastigium very small, narrow, strongly compressed, finely sulcate dorsad, in profile rounded at apex and not in contact with the fastigium of the front: occiput strongly arcuate in length and breadth. Eyes prominent, broad ovate in basal outline, the juxta-antennal portion of the margin slightly flattened. Antennae about two and one-fourth times as long as body, slender.

Pronotum subsellate, not elevated cephalad, in caudal fourth appreciably ascending dorso-caudad, all margins of pronotum cingulate: greatest caudal width of disk of pronotum contained one and one-third times in greatest length of same; cephalic margin of disk weakly but distinctly concave, caudal margin of disk subtruncate mesad, broadly arcuate laterad. Lateral lobes with greatest depth contained one and one-half times in greatest dorsal length of same: cephalic margin of lateral lobes moderately oblique arcuato-truncate; ventro-cephalic angle rounded obtuse-angulate; ventral margin arcuate subtruncate, slightly oblique; ventro-caudal angle rounded obtuse; caudal

margin sinuate oblique, the sinuation ventral; surface of the lobes distinctly impressed in the usual position of the humeral sinus.

Tegmina in length subequal to that of the head and pronotum, of the total tegminal length the stridulating field occupies more than three-fourths, apex of tegmina not surpassing the fourth abdominal tergite: costal margin briefly arcuate proximad, broadly arcuate distad, the portion mesad straight; apex subrectangulate; sutural margin strongly sinuato-arcuate about inflated stridulating area, distad very briefly arcuato-emarginate: mediastine vein weak and irregular; humeral and discoidal veins fused into a very robust humeral trunk, this arcuate in proximal two-thirds; median vein nearly straight, well separated from the humeral trunk in the arcuate section of the latter, fusing with this at distal third; ulnar vein furcate at distal three-fifths of length: stridulating field of left tegmen about one and one-third times as long as broad, bounded laterad by the very broad membranous channel or external speculum, the depth of which is traversed longitudinally by the weakly defined anal vein; stridulating vein straight, transverse, very robust, triangular in section; speculum with greatest length slightly greater than proximal width of same: speculum of right tegmen larger than that of left tegmen, with general form more circular. Wings falling slightly short of the tegminal apices, rounded, folded fan-wise.

Prosternum with a pair of very elongate spines; mesosternum and metasternum with the sternal lobes developed into pronounced spiniform productions as long as the prosternal spines, those of the mesosternum more acute than those of the metasternum.

Penultimate abdominal tergite very short; distal margin mesad obtuse-angulate emarginate, produced laterad of this into rectangulate projections, a distinct sulcus extending cephalad from the bottom of emargination, this and the internal margin of the triangular projections appreciably thickened and subcingulate; antepenultimate tergite with a medio-longitudinal lamellate carination; supra-anal plate small, trigonal, dorsal surface excavate. Cerci broad at base, relatively elongate and forcipate distad, tapering from proximal sixth, where the accessory tooth, found in the species of this genus, is situated, being developed as a decurved claw; median third of cereus nearly straight; distal third of cereus moderately incurved, the apex acute and weakly recurved: dorsal surface of proximal third of cerci impressed mesad, the internal margin elevated and thickened, the impression and the external section papillose. Subgenital plate elongate, the distal margin obtuse-angulate emarginate; styles relatively short and thick; styliferous pillar-like ridges decided, a medio-longitudinal carination pronounced.

Femora with all ventral margins supplied with series of numerous small spines; genicular lobes bispinose, the spines of the caudal lobe of the cephalic femora very short. Cephalic femora longer than combined length of the head and pronotum; spines of ventro-cephalic margin appreciably longer than those of the ventro-caudal margin: cephalic tibiae with foramina rimate, the spines of ventral margins hexacentroid in character, six in number on

each margin, the proximal three uniform in length, the distal three decreasing in length; dorso-caudal margin with five spines, dorso-cephalic margin with one or two spines. Median femora subequal to cephalic femora in length: median tibiae with at least six pairs of ventral spines, which are hexacentroid but shorter than those of cephalic tibiae; dorsal margins each with five to six spines. Caudal femora about four-fifths as long as the body, slender, moderately inflated proximad: caudal tibiae slightly longer than the femora, all margins spined; distal spurs three-paired, the third from the dorsal surface little more than one-half as long as the second, dorsal pair nearly as long as second pair, external first and second spurs slightly shorter than their internal equivalents: caudal tarsi with plantula short, rounded.

Allotype.—♀; same locality as type. September 2, 1918. (J. A. Kusche.) [Hebard Collection.]

The features here given are those of difference from the description of type (♂).

Size somewhat larger than in male sex. Pronotum as in male, but elevation of caudal section less decided. Tegmina somewhat longer than the greatest dorsal length of pronotum, ovoid-elliptical in outline, broadly overlapping over dorsal surface of abdomen; greatest width of tegmina (flattened) contained about one and one-half times in greatest length of same, point of greatest width slightly proximad of middle: costal margin weakly arcuate mesad, more decidedly arcuate proximad and distad, the apex narrowly rounded rectangulate; sutural margin broadly arcuate: venation of all but the axillary field much as in male but the veins weaker, axillary field with three irregular oblique veins, which are connected by numerous crossveins, the areolets thus formed very similar to those of the marginal and discoidal fields. Wings of the same structure and proportions as in the male, and therefore actually smaller when compared with the pronotum.

Abdomen with disto-dorsal tergite divided much as in the male, but the fissation extends far deeper and embraces the whole visible portion of the segment, the lateral angles of fissation not produced but rounded. Cerci relatively short, inflated and incrassate in proximal half, thence tapering rather sharply to the very slender distal section; surface papillose, with erect hairs. Ovipositor subequal to the body in length, robust proximad, becoming slender at proximal third, the margins of distal two-thirds parallel, entire, the whole weakly but appreciably decurved, apex very acute, the dorsal margin oblique truncate before apex. Subgenital plate short, subinflated, lateral halves subquadrate in lateral view, the lateral angles rounded rectangulate: median line of the plate with an elevated lamellate carina in proximal half, which mesad gives way to an impressed area with two obscure indented lines, which embrace the end of the carina; distal margin mesad with the distal margins of the lateral halves forming a U-shaped emargination when viewed from the venter, this having a very small, but similar, emargination at its very base. Seventh sternite with a median subcompressed, trigonal projection, which is more vertical caudad than cephalad.

Cephalic tibiae with four spines on dorso-caudal margin, none on dorso-cephalic margin. Median tibiae with as few as three spines on dorso-cephalic margin. Caudal femora as long as the body (exclusive of ovipositor).

Of the fair-sized series of the species before us but a small portion of the adults, i. e. four males, retain any of the original color shades, the other specimens having had these injured or destroyed by immersion in liquid preservative. The following color description is based on two of the males which have the best preserved coloration, one of these being the type.

General color lettuce green, passing to pale buckthorn brown on the abdomen (probably lettuce green in life), the dorsum of the pronotum of the male with a faint wash of the same. Eyes buckthorn brown mottled with fuscous. Antennae with two proximal joints of the general color; remainder passing from pale russet proximad to yellowish olive and then to bister. Pronotum with the cephalic margin pencilled dorsad and for a considerable distance ventrad with fuscous; caudal margin of disk and caudal section of lateral lobes with an olivaceous fuscous band, which is broadest, though not sharply defined, at the angles, narrower mesad and there including the caudal margins, on the lateral lobes quite narrow, but sharply defined and extending ventro-cephalad to the ventral margin, on the lobes the area caudad of the line reed yellow. Tegmina of the general color, certain of the principal veins pencilled in scheele's green; areolets very largely individually blotched with fuscous, the margins about the blotches occasionally pale buckthorn brown, the speculum with much fuscous. Wings pale lumiere green with a speckling of variously sized, but always rounded, dots of shining black. Cerci of the general color. Femoral spines narrowly fuscous tipped. Cephalic and median tibiae with a weak olive lake dorsal wash; caudal tibiae with a similar wash, which may become as dark as brownish olive. Tibiae with spines of ventral surface on their proximal surface having a hair-line of black and a black tip; of dorsal surface of cephalic and median tibiae with similar lines, of caudal tibiae of general color with dark tips; tarsi dresden brown (probably green in life), laterad washed with mummy brown.

Measurements (in millimeters)

	Length of body (exclusive of ovipositor)	Length of pronotum	Greatest caudal width of pronotum	Length of tegmen	Length of cephalic femur	Length of caudal femur	Length of ovipositor
♂, *type*.....	33.5	6.7	5	10	10.6	27.3	..
♂, *paratype*....	32.3[9]	6.6	4.9	9.6	11	27.6	..
♂, *paratype*....	25[9]	6.7	4.6	9.5	11.2	28.2	..
♀, *allotype*.....	33.2	7.7	5	8.2	12	21	33
♀, *paratype*....	37.5	8	4.7	9.5	12.5	32.7	33
♀, *paratype*....	26.5[10]	7.4	4.8	8.6	12	30.5	32

[9] Body greatly arched, and actual length in life somewhat greater.

[10] Abdomen much shrunken.

In addition to the type and allotype we have before us a paratypic series of five males and five females from Venvidio, Sinaloa, Mexico, taken by J. A. Kusche on dates between August 11 and September 2, 1918. The male specimens show variation in the extent to which the speculum is occupied by anastomosing reticulations, these occasionally uniformly occupying all of the speculum.

In one male and one female (allotype) we find one of the ventral pair of distal spurs on the caudal tibiae absent. These probably have been accidentally lost, in both cases the missing spur being absent from the external side. The type is the only specimen bearing spines on the dorso-cephalic margin of the cephalic tibiae, while the dorso-caudal margin of the same has in the series from four to five spines, generally four. The median tibiae have the spines of the dorsal surface varying from three to six on the cephalic, generally five, and three to eight, generally five, on the caudal margin.

In addition to the adults we have before us seven male and fourteen female immature specimens, taken at Venvidio, August 8 to September 2, 1918, by Kusche. The males represent the two instars preceding maturity, the females represent the three instars preceding maturity. These individuals show that in the male sex the proximal cercal tooth is well indicated in the instar preceding maturity, while in the female sex the projection on the seventh sternite is very slightly developed in the same instar.

PEDIODECTES Rehn and Hebard

1894. *Orchesticus* Scudder, (not of Saussure, 1859), Can. Ent., XXVI, pp. 178 and 180.

1916. *Pediodectes* Rehn and Hebard, Trans. Am. Ent. Soc., XLII, p. 45.

The name *Stipator* was proposed in 1900 by Rehn for *Orchesticus* of Saussure, which had been found to be preoccupied by *Orchesticus* of Cabanis. For some time *Stipator* was used for the species of the present genus, but in 1916 it was found that the genotype, *americanus* of Saussure, was a member of the genus *Atlanticus* of Scudder, described in 1894. In consequence *Stipator* fell as a synonym of *Atlanticus* and it was necessary to propose a new name for the genus of which a new species is described below. The type of the genus is *grandis* of Rehn.

Pediodectes daedalus[11] new species. (Pl. IX, figs. 8, 9, 10 and 11.)

This species, with *P. mitchelli* (Caudell) and *P. pratti* (Caudell), forms a distinctive group of the genus, striking in the heavy build, broad pronotum, short ovipositor and handsome coloration.

Nearest relationship is with *pratti*, the present species separable by its slightly less robust structure, much less contrasting transverse banding of the dorsal surface of the abdomen, strikingly darkened apices of the caudal femora and characters of the male penultimate tergite and cerci.

Type.—♂; Uvalde, Uvalde County, Texas. Elevation, 1100 feet. August 21, 1912. (Rehn and Hebard.) [Hebard Collection, Type no. 537.]

Size medium for this genus of large species, form robust, surface glossy.

Vertex as in *pratti*, one and three-quarters times as broad as first antennal joint, narrowing very strongly to the interfastigial suture. Pronotum as in *pratti*, strongly convex in transverse section, there being no carina indicated or definition of any kind between the disk and lateral lobes; caudal portion of pronotum produced, completely covering the tegmina, with caudal margin transverse, very feebly convex; lateral lobes deep with humeral sinus broad but distinct. Prosternal spines well developed.

Abdomen stout, each tergite, unlike in *pratti*, showing caudad a slight indication of medio-longitudinal carination. Penultimate tergite produced caudad in two slender, slightly decurved processes which taper to their slender apices, the intervening space very narrowly V-shaped[12], the interval between the tips of these processes about three-quarters the length of one of them. Cerci about two and two-thirds times as long as broad, shaft cylindrical, slightly inbowed, bearing internally near the apex a triangular projection[13] which terminates in a stout, slightly decurved tooth, the bulk of this portion slightly greater than that of the apical portion of the cercus, which is rather sharply conical. Subgenital plate supplied with styles two and one-half times as long as wide, the interval between these equal in length to one of the styles and acute-angulate emarginate.

Cephalic and median femora with margins unarmed except for a single small spine on the ventro-cephalic margin of one of the former (in the series rarely armed, the ventro-cephalic margin of the cephalic femora showing in individuals as many as two, of the median femora up to four spines). Caudal

[11] From δαίδαλος, beautifully wrought.

[12] In the type these diverge slightly, in the paratypic male they are parallel. In the series of *pratti* before us these processes are slightly over half as long and their tips are separated by an interval equal to one and one-half times the length of one of the processes, except in one specimen in which these latter dimensions are equal.

[13] In the paratypic male this projection is more elongated and slender, including the terminal tooth twice as long as the apical portion of the cercus.

femora with ventro-external margin armed with none to one (in the series none to two) spines; ventro-internal margin armed with six to seven (in the series five to ten) spines. Cephalic genicular lobes of cephalic femora and genicular lobes of median femora armed with two short spines (occasionally one in the series). Caudal genicular lobes of cephalic femora unarmed (in the series rarely with one or two small, short spines). Genicular lobes of caudal femora unarmed. Cephalic femora with dorsal surface armed along the caudal margin with three spines, cephalic margin unarmed. Caudal tibia armed with three pairs of distal spurs, of which the medio-internal is the longest, as long as the full length of the metatarsus, the medio-external three-quarters as long as the medio-internal, the dorsal pair each slightly over half as long as the medio-external. Plantula over half as long as the full length of the metatarsus.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Agrees closely with male, differing in the following features. Size larger. Tegmina apparently not developed. Penultimate tergite produced meso-caudad in two small rounded projections, between which and above the small rounded supra-anal plate this tergite is rotundato- emarginate in an area deeper than broad. Cerci simple, straight, elongate conical. Ovipositor comparatively short, slightly over half as long as caudal femur, moderately and evenly upcurved, with acute apex at juncture of valves, the distal portion and margins polished, each valve distad medio-longitudinally and also along its free margin delicately carinate. Subgenital plate boxing base of ovipositor, with free margin incurved so that the plate appears angulate-emarginate mesad.

Sexes similar in coloration. Surface shining. Base coloration cinnamon-buff. Face and vertex cinnamon-buff, cheeks tinged with slate, dorsal surface of head sepia. Pronotum sepia, narrowly margined cephalad and broadly along ventral margins of lateral lobes with cinnamon-buff, caudal margin of disk narrowly blackish, this broadening on each side and filling the distal portion of the produced section of the lateral lobes. None of these markings with margin sharply defined. Underparts and limbs cinnamon-buff, the caudal femora broadly tipped with blackish brown. Exposed metanotum cinnamon-buff, median segment suffused with sepia in distal portion, with caudal margin very narrowly blackish chestnut. Tergites to penultimate tergite cinnamon-buff, heavily tinged with sepia, particularly dorsad on each side, with caudal margin of each very narrowly blackish chestnut. Penultimate tergite cinnamon-buff heavily tinged with sepia.

In the individuals of intensive coloration the occiput, major portion of the pronotum and slightly broader caudal margins of the tergites are very dark, mummy brown. In two specimens of recessive coloration the occiput and and pronotum are buckthorn brown washed laterad with olive lake, the caudal margin of the pronotum very narrowly blackish and the other dark areas correspondingly paler, except the caudal margins of the tergites, which are as contrastingly darker as in the more usual condition.

The limbs, except the dorsal portion of the caudal femora, are washed with green in occasional individuals, this decided on the ventro-proximal portion of the ovipositor in such females. The female from Del Rio, in addition to showing this feature, has a heavy blackish brown line extending along the proximal two-thirds of the dorsal surface of the caudal femora. Except for this one feature, this specimen agrees fully with the other females of *daedalus* before us.

A very different general appearance is produced in *pratti* by the unicolorous caudal femora, and the more broadly and contrastingly banded tergites and pronotum showing lighter general coloration, but which normally have the caudal margins more broadly suffused.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest width of pronotum	Length of caudal femur	Length of ovipositor
♂					
Uvalde, Texas, *type*	27.5	8.7	7.2	25.2	.....
Uvalde, Texas, *paratype*	28.3	8.9	7.7	26.7	.....
♀					
Uvalde, Texas, *allotype*	29.8	10.2	8.8	30.3	16
Uvalde, Texas, *paratypes*	28.4–31	8.7–10.2	7.9–8.7	26.2–30	15–17
Del Rio, Texas	28.2	9.6	8	28.1	16.2

In addition to the type and allotype, we have at hand one male and seven female paratypes bearing the same data, and in addition a female, taken at Del Rio, Valverde County, Texas, 1100 feet, August 23, 1912, by Rehn and Hebard. This series is in the Philadelphia Collections.

The species was found in the same type of environment at both localities, i. e., on rolling hills covered with a low sensitive-leaved acacia (*Acacia berlandieri*), various low thorny desert shrubs, occasional arborescent yuccas and two species of prickly pear cactus. The single specimen from Del Rio was taken in the sensitive-leaved acacia, in which bush the species was found fairly common at Uvalde. At that locality two individuals were also found in the Sotol (*Dasylirion* sp.), and a number were taken from a rat's nest (*Neotoma* sp.).

The environment described above proved decidedly productive, and in the *Acacia berlandieri* the then undescribed *Phaulotettix eurycercus* Hebard and other interesting species of Orthoptera were found.

Anabrus spokan[14] new species. (Pl. IX, figs. 12, 13, 14 and 15.)

The present species is readily distinguished by the presence of a weak but percurrent median carina on the pronotum, which is strongest in the caudal portion, while the disk is defined by more apparent lateral carinae which, though rounded, are well defined caudad. In addition the male cerci are distinctive, though of the same general type as developed in *A. simplex* Haldeman. Nearest agreement with *A. simplex maculatus* Caudell is shown.

Type.—♂; Sand Point, Lake Pend d'Oreille, Kootenai County, Idaho. Elevation, 2100 feet. August 2, 1909. (Rehn and Hebard.) [Hebard Collection, Type no. 536.]

Size rather small for this genus, which includes only large species; about as in *A. simplex maculatus*. Form normal, surface glossy.

Vertex slightly over twice as wide as proximal antennal joint. Pronotum strongly produced caudad, with caudal margin of disk very broadly convex, almost transverse, very similar in form to that of *simplex maculatus*, but differing signally in the following features: lateral margins of disk weak but appreciable proximad, becoming well developed in caudal half, rounded but much more decided than in *simplex*; median carina of disk percurrent, very faint in proximal portion but more conspicuous in caudal portion. The tegmina slightly surpass the pronotum, so that the heavily veined marginal area is exposed. Prosternum unarmed.

Abdominal tergites each showing a weak but distinct medio-longitudinal carina in the caudal portion, except the penultimate tergite, which is broad, with surface weakly bilobate and caudal margin transverse, showing weak concavity above each cercus, the median V-shaped portion composed of a soft pliable integument, to the caudal margin of which the triangulate shield-shaped supra-anal plate is attached. Cerci, as in *simplex* and *simplex maculatus*, dividing into two arms which, curving inward distad, are each terminated in a long sharp tooth directed inward, but, unlike that species, the external or dorsal arm is considerably over twice as long to the point of inward curvature as the internal or ventral arm. Subgenital plate with two heavy rounded carinae in distal half, which terminate in two rather elongate styles, the margin between these rounded rectangulate (varying in the series to obtuse-angulate) emarginate. Styles cylindrical, nearly five times as long as wide, showing a slight proximal decurvature.

Cephalic coxae armed with a large, flattened, triangular spine, less than twice as long as its basal width. Limbs rather plentifully supplied with minute, short hairs, the sockets of these represented by minute pits, these particularly noticeable on the dorsal surfaces of the caudal femora. Cephalic and median femora with ventral margins unarmed, except for one spine on the ventro-cephalic margin of one of the former. Caudal femora with ventro-external margin only armed with (two and three, two to nine in the series)

[14] A branch of the Salishan Family of Indians, known as the Spokan, inhabited the region from which the present species is known.

very small, short, procumbent spines. (In the series ventro-cephalic margin of cephalic femora armed with none to three spines; ventro-cephalic margin of median femora with none to five, ventro-caudal of median with one to eight spines.) Cephalic genicular lobe of cephalic and median femora armed with two minute teeth. Caudal genicular lobe of cephalic femora unarmed. Caudal genicular lobe of median femora armed with one minute tooth (in the series sometimes none, rarely two). Genicular lobes of caudal femora unarmed (or in the series one to all supplied with a single vestigial tooth). Cephalic femora with dorsal surface armed along the caudal margin with four and five (in the series three to five) spines and along the cephalic margin with none or one (in the series none to three) spines. Caudal tibiae armed with three pairs of heavy distal spurs, of which the medio-internal is the longest, nearly as long as the dorsal length of the metatarsus, the medio-external two-thirds as long as the medio-internal, the dorsal pair each two-thirds as long as the medio-external. Plantula slightly over half as long as the dorsal surface of the metatarsus.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Agrees closely with the male, differing in the following respects. Tegmina represented by rounded pads, which are usually wholly concealed by the pronotum from above (in occasional specimens the extremities of these pads project slightly and are visible from above). Penultimate tergite much more simple but similarly formed to that of male. Supra-anal plate shorter with margins more convex than in the opposite sex. Cercus simple, elongate, conical, moderately incurved to the acicuate apex, about four times as long as its basal width. Ovipositor elongate, gently upcurved, with acute apex at juncture of valves, the distal portion and margins polished and unspecialized. Antepenultimate tergite produced ventrad on each side in a rounded area, which lies latero-ventrad before the base of the ovipositor and caudad of the lateral rounded flaps of the subgenital plate, extending as far caudad as the caudal margin of the median section of the subgenital plate.[15] Subgenital plate highly specialized (for carrying the male sperm sac) as in *simplex*; small lateral portion produced caudad on each side in rounded flaps, large median portion roughly quadrate, medio-longitudinally carinate, with caudal margin transverse and curled upward briefly, lateral margins folded inward for a decidedly greater distance, so that in caudal aspect a roughly and broadly V-shaped area is formed with the dorsal apices produced inward. The limb armament is apparently similar in the sexes.

The similarity in structure, particularly that of the pronotum, makes association of the sexes of this species an easy matter.

Surface shining. General coloration a very slightly mottled bister or chestnut brown. The produced portion of the lateral lobes of the pronotum very dark brown, the remaining ventral margin of the lateral lobes often narrowly

[15] These are referred to as the subgenital lobes of the female by Caudell in his treatment of this genus. Proc. U. S. Nat. Mus., XXXII, pp. 351–362, (1907).

very dark brown, in one specimen, however, much paler, tawny-olive. Face much paler, cinnamon-buff to clay color, the labral suture itself sometimes dark brown. Exposed portions of tegmina vandyke brown. Caudal femora with small blotches of blackish brown about each spine on the ventral margins. Such brown individuals show little apparent maculation, but under the microscope are seen to be finely and richly mottled.

A solidly green color phase is developed in this species, represented by one male and three female paratypes and a Loon Lake female before us. In this phase the green coloration is immaculate, rich bice green. The produced portion of the lateral lobes of the pronotum is vandyke brown, while the eyes, antennae, excepting the proximal joint, and all but the proximal portion of the ovipositor are buckthorn brown. The small blotches of blackish brown about each spine on the ventral margins of the caudal femora are much reduced in this color phase. The green coloration has faded somewhat, particularly on the abdomen, in the series before us.

Measurements (*in millimeters*)

	Length of body	Length of pronotum	Least width of pronotal disk	Greatest width of pronotal disk	Length of caudal femur
♂					
Sand Point, Idaho, *type*	31	10	3.3	6.3	20.8
Sand Point, Idaho, *paratypes*	26–28	9.3–9.6	3.1–3.2	5.9–6	19.2–20.7
Loon Lake, Washington	26	10.8	3.9	6.2	22.8

			Greatest width of pronotal disk	Length of caudal femur	Length of ovipositor
♀					
Sand Point, Idaho, *allotype*	30	9.8	5.8	22.3	23.2
Sand Point, Idaho, *paratypes*	25.5–30.5	9.2–10.3	6–6.1	22–22.6	20.8–23.6
Little Spokane River, Washington	27.3	9.5	5.2	22	21.2
Loon Lake, Washington	23–25	9.9–10.4	5.8–5.9	22	20.8–20.6

In addition to the type and allotype, we have before us three male and six female paratypes, bearing the same data, belonging to the Philadelphia Collections. We have also at hand a female, taken on the Little Spokane River, Washington, July 26, 1882, by S. Henshaw, and one male and four females taken at Loon Lake, Colville Valley, Washington, July 23 to 25, 1882, by S. Henshaw, all in the Hebard Collection ex Bruner.

The Loon Lake series shows some difference from that from Sand Point in having the expansion of the pronotum caudad less decided, with median and lateral carinae of the disk less distinct cephalad. One specimen of the Loon Lake series has the ovipositor straight.

The type series was taken in the morning of a bright day at Sand Point, Idaho. These specimens were found in a brulé about a low tangle of raspberry vines and thistles, overgrowing charred logs and stumps. The stridulation of the males was very faint for so large an insect, in fact a weak buzzing, much like that of *Conocephalus fasciatus* (DeGeer). All of the specimens were found crawling about near the ground, and were by no means as active as the individuals of *simplex* which the junior author had previously taken in the Yellowstone National Park. Neither did the present individuals appear to have nearby holes, into which to hurry when approached.

OREOPEDES[16] new genus

The present genus represents an extraordinary blending of the characteristics of other Decticine genera. The convexity of the pronotum, without carinae, suggests *Atcloplus*. The male penultimate tergite shows nearest structural resemblance to that found in *Cacopteris*,[17] though not as highly specialized. The male cerci are of a type similar to that developed in certain species of *Eremopedes*.

The decided production caudad of the pronotum, which conceals all but the caudal margins of the tegmina, and caudal tibiae lacking the dorsal pair of distal spurs, constitute other diagnostic features of value which do not occur in any of the more closely related genera.

In linear position we place this genus after *Atcloplus* and before *Eremopedes*.

The genus is monotypic. Genotype.—*Oreopedes cryptoptera* new species.

Generic Description.—Size small, form robust though moderately slender for the Decticinae. Head with vertex rather broad, narrowing rather decidedly to the fastigio-facial suture. Pro-

[16] From ὄρος and πηδάω, mountain leaper.

[17] We do not believe *inermis* Scudder, genotype of *Cacopteris*, to be congeneric with *californicus* Pictet (=*hermanii* Thomas), genotype of *Idiostatus*. We therefore consider *Cacopteris* a valid generic unit.

notum elongate, almost completely concealing the tegmina from above, the metanotum strongly produced caudad; disk rounding evenly into the lateral lobes, the latero-caudal shoulders subobsolete, suggesting the type developed in *Ateloplus* but very much more elongate; lateral lobes over twice as long as deep, with a broad but distinct humeral sinus, convex callosities obsolete. Tegmina in male with all but caudal margins concealed by the pronotum. Dorsal surface of male abdomen medio-longitudinally carinate. Penultimate tergite specialized, the type of specialization similar to that found in the genus *Cacopteris*. The type of specialization of the male cerci similar to that developed in certain species of *Eremopedes*. Male subgenital plate with styles very greatly reduced. Prosternum unarmed. Lobes of mesosternum and metasternum very weak. Limb armament weak. Cephalic tibiae with dorsal surface armed along external margin with three spines. Caudal tibiae armed distad with two pairs of spurs, the small dorsal pair usually found in the allied genera having disappeared, the ventral pair moved up the margin more than is usual and in consequence a greater distance from the median pair. Plantula small, longer than broad, not half the total length of the metatarsus.

Oreopedes cryptoptera[18] new species (Pl. X, figs. 1, 2, 3, 4 and 5.)

Though insignificant in appearance, this species, when critically examined, is found to be one of the most interesting forms of the North American Decticinae. This is due to the surprising combination of characters and specialization exhibited.

Type.—♂; Silver Canyon Trail, White Mountains, Inyo County, California. Elevation, 8300 feet. September 10, 1919. (M. Hebard.) [Hebard Collection, Type no. 555.]

The following specific diagnostic characters are given, in addition to the characters stated in the generic description. Size small for the Decticinae, comparable to that of *Idiostatus callimera* here described. Form robust, but moderately slender for the Decticinae, as in the above mentioned species.

Vertex very slightly wider than proximal antennal joint. Pronotum smooth, the metazona slightly over half the total length, transverse sulci faintly indicated in dorso-lateral area only.

Penultimate tergite rather large, briefly triangularly produced caudad on each side and just within the cerci, the apices of these productions bluntly rounded, the distal margin between the productions transverse, but the surface of the plate is weakly concave in an area a triangle would occupy, the

[18] From κρυπτός and πτερά = hidden wings.

sides of which would in part be formed by the productions. Cercus about three times as long as basal width, the internal portion showing slight lamellation which increases to distal three-fifths, widening in distal half of that portion, thence narrowing more rapidly, the lamellation disappearing and the apex rather heavily and bluntly rounded; at the point of greatest width a small stout tooth occurs on the internal margin, preceded by smaller irregular teeth along the internal margin half the distance to the base of the cercus; the cercal armament is thus of a type suggesting that found in species of *Eremopedes*. Titillator represented by two very slender, moderately diverging, chitinous shafts, the external margins of which are rather coarsely serrate, the apices of these serrations directed proximo-laterad. Subgenital plate with two weakly defined, heavy carinae, which converge weakly distad to bases of styles. Styles very greatly reduced, represented by minute rounded projections not as high as wide, situated in sockets, between which the distal margin of the subgenital plate is angulate-emarginate at slightly more than a rectangle, with apex rounded.

Ventral margins of cephalic and median femora unarmed. Caudal femora with ventral margins armed with a few (one and one external and three and four internal) minute spines. Genicular lobes unarmed. Largest (medio-internal) spur of caudal tibiae nearly as long as dorsal length of metatarsus; ventral pair of spurs very small, the smaller not as large as, the larger little greater than, the larger of the marginal spines.

General coloration sayal brown, showing a microscopic and weak marbling of bister, except on disk of pronotum, where this is subobsolete, and on median portion of dorsal surface of abdomen proximad, where it is very weak. Brief visible portion of tegmina with veins cream buff and interstices bister. Abdomen with proximal tergites suffused in large lateral areas with bister, the dorsal margins of these sinuous on each side, adjacent to which the dorsal portion of the abdomen is slightly paler than elsewhere in that section. Ventral surface cinnamon-buff. Cephalic tibiae with suffusions of mummy brown at foramina and near distal extremity, traces of such marking showing distad on cephalic and median femora and median tibiae. Ventral spines of cephalic tibiae, all spines of median tibiae and proximo-ventral spines of caudal tibiae with flecks of bister at their bases. Distal tarsal joint of all limbs bister at base, tinged with this color distad.

Length of body, 18.4 mm.; length of pronotum, 5.8; length of metazona, 3.1; greatest width of pronotal disk, 2.8; total width of pronotum, 3.9; length of caudal femur, 13.2.

This interesting Dectieid was found in a small area of dried yellow grass, apparently driven from sage brush, growing in an opening in the junipers. Intensive examination of the immediate vicinity failed to locate additional specimens. The locality was on the narrow summit of a ridge, somewhat above the middle section of the area of juniper and pinyon, on the western slope of

the mountains. It is interesting to note that on these arid mountains the junipers and pinyons extend upward to near timber line, a weak growth of timber-line pines and scattered patches of aspen occurring above them, no distinctive forest whatever distinguishing the Canadian Zone.

Idiostatus inyo new species (Pl. X, figs. 6, 7 and 8.)

This species, though of pale and obscure coloration, is closely related to *I. callimera* here described. The most striking differences are the much more elongate caudal limbs, very weak indication of lateral carinae on pronotum, highly specialized and distinctive male penultimate tergite and similarly specialized but much longer and more slender cerci.

So weak is the definition between the disk and the lateral lobes of the pronotum in this species, that the structure shows some resemblance to the type normal in the genus *Ateloplus*.

Type.—♂; Near Owen's Lake, Inyo County, California. July, 1912. [Academy of Natural Sciences of Philadelphia, Type no. 5367.]

Size small for the genus, form slightly more slender than that of *I. inermis* (Scudder). Vertex one and three-fifths times as wide as proximal antennal joint.[19]

Pronotum smooth; disk rounding into lateral lobes so gradually that lateral boundaries of the former can not be seen except caudad, where very weak, rounded shoulders occur. Pronotum produced caudad a very short distance; lateral lobes longer than deep, the caudad margin from the rather broadly rounded ventro-caudal angle oblique and showing no humeral sinus, convex callosity at this point moderately broad, feebly convex, delimited along its internal margin by a delicate but distinctly depressed line. Tegmina of same type as found in *callimera* and *inermis*, extending beyond the pronotum a distance equal to two-thirds the pronotal length, with stridulating field exposed beyond stridulating vein. Prosternum unarmed.

Penultimate tergite produced, surface weakly bilobate, caudal margin produced in two rounded rectangulate projections, which are somewhat wider than long, with a median emargination of about equal size between, the margins of which emargination are subchitinous. Cerci with shaft moderately stout, cylindrical, nearly four times as long as their proximal width, weakly incurved, armed at end of proximal two-thirds of internal margin with an erect, sharp spine, which is nearly as long as the remaining distal portion of the cercus and is almost vertical to the shaft, tilted slightly proximad, apex of cerci armed with a small tooth, less than a third as long, which is directed mesad.

[19] Apparently due to distortion, the vertex overhangs the face at the interfastigial suture in the present specimen.

Subgenital plate roughly scoop-shaped, with two heavy, rounded carinae converging distad to the bases of the small styles. Styles cylindrical, three times as long as wide, separated by a distance one and one-half times as long as one of them; the emarginate caudal margin of the supra-anal plate in this interval has the sides straight convergent, the basal portion, which is of slightly greater length, transverse.

Limbs with hairs as in *callimera*. Cephalic and median femora with ventro-cephalic margin armed with a single small spine. Caudal femora with ventral margins armed with (four and five) external and (three and four) internal small spines. Genicular lobes of femora unarmed, except the cephalic of the cephalic femora and the caudal of the median femora, which bear a single small spine, and the cephalic of the median femora, which bears two still smaller spines. Cephalic tibia with dorsal surface armed with three spines along the caudal margin. Caudal tibiae armed with three pairs of elongate distal spurs, of which the medio-internal is the longest, as long as the dorsal length of the metatarsus,[20] the medio-external two-thirds as long, the dorsal pair each two-thirds as long as the medio-external. Plantula about half as long as metatarsus.

General coloration ochraceous-buff, very finely marked with blackish brown around eyes and dorsal portion of internal margin of convex callosities of lateral lobes. Tegmina immaculate. Abdominal tergites with caudal margins showing very small lateral and dorsal flecks of blackish brown, and intervening dots of lighter brown of still smaller size. Cephalic and median limbs and caudal femora flecked at base of each spine with blackish brown.

Length of body, 19.5 mm., length of pronotum, 5.2; total width of pronotum, 5; length of exposed portion of tegmen, 3.7; length of cephalic femur, 5.2; length of median femur, 6; length of caudal femur, 19.3; length of caudal tibia, 20.

The type is unique.

Idiostatus callimera[21] new species (Pl. X, figs. 9, 10, 11 and 12.)

This handsome species is readily recognized by its striking coloration, the markings of the caudal femora being particularly distinctive.

The coloration of the pronotum is such that the disk appears to be sharply divided from the lateral lobes, but this is more apparent than real, the lateral carinae being well developed only in the caudal portion and much as in *I. inermis* (Scudder). We emphasize this feature as a superficial examination might easily lead one to believe these carinae to be percurrent and more sharply defined, as in *Idionotus brunneus* Scudder, than they actually are.

[20] The metatarsus in this species is longer than in *callimera*, the longest spur decidedly longer, with shaft straighter than in that species.

[21] From καλλι-μῆρα = beautiful thighs.

The male cerci agree in type with those of *I. inyo* here described, representing a development very different from that found in any other known species of *Idiostatus*. The male penultimate tergite shows the least specialization of the known species of the genus, and consequently we would place *callimera* first in linear arrangement.

Type.—♂; Lone Pine Canyon, eastern slope of Sierra Nevada Mountains, Inyo County, California. Elevation, 8400 feet. September 8, 1919. (M. Hebard.) [Hebard Collection, Type no. 550.]

Size small for this genus, which includes very large and small forms. Form slightly more slender than in *inermis*. Vertex very slightly wider than proximal antennal joint. Pronotum smooth; disk rounding evenly into the lateral lobes except in the produced caudal portion, where distinct rounded shoulders occur, there as pronounced and slightly more sharply rounded than in *inermis*; pronotum produced caudad a short distance, the lateral lobes longer than wide, in this respect intermediate between *inyo* and *inermis*, the degree of difference being slight. Lateral lobes of pronotum with caudal margin from the rather broadly rounded ventro-caudal angle straight, oblique, then broadly convex, showing no humeral sinus; convex callosity opposite straight portion moderately broad and feebly convex, sharply delimited along its internal margin. Tegmina of same type as found in *inermis*, extending beyond the pronotum almost the full pronotal length, with stridulating field beyond stridulating vein exposed. Prosternum unarmed.

Penultimate tergite small, simple, shorter than preceding tergite, caudal margin broadly and weakly concave on each side, becoming slightly convex meso-laterad at juncture with the triangular supra-anal plate, which is three-quarters as long as the penultimate tergite, that segment with surface rather deeply concave toward base of supra-anal plate but not subchitinous. Cerci with shaft heavy, cylindrical, in length twice its basal width, dividing into a distal and internal conical projection, the projections of like size[22] and similarly with apex armed with a sharp straight tooth, bent slightly inward from the direction of the projection. Subgenital plate rather scoop-shaped, with two heavy rounded carinae converging distad to the base of the small styles. Styles cylindrical, two and one-half times as long as wide, separated by a distance twice as long as one of them; the caudal margin of the supra-anal plate in this interval transverse, showing a very feeble concavity.

Limbs moderately supplied with hairs, the sockets of these represented by microscopic pits, this particularly noticeable on the dorsal surfaces of the caudal femora. Femora with ventral margins unarmed, except ventro-caudal margins of caudal femora, which are unarmed or with one (one to three in the series) spine. Genicular lobes unarmed (occasionally with a

[22] Slight variation occurs, as is shown by the paratypes, in which the distal projection varies from slightly larger to slightly smaller than the marginal projection.

minute spine on caudal lobe of median femora in the series, and in one paratype with an even smaller spine on a cephalic lobe of the cephalic femora). Cephalic tibiae with dorsal surface armed with three spines along the caudal margin.[23] Caudal tibiae with distal spurs as described for *ingo*, except that they are not as elongate, the longest more generally curved. Plantula about one-third as long as metatarsus.

General coloration sayal brown.[24] Head uniformly of this color, microscopically mottled with blackish, except for a broad postocular band of black on each side. Pronotum with disk uniform warm sepia, margined laterad[25] with black,[26] which dark area expands caudad and fills the entire area of the produced portion of the lateral lobes to the convex callosities, which are white.[27] Tegmina ochraceous-buff, the portion proximad of the tympanum tinged with blackish. Dorsal surface of abdomen verona brown, deepening through warm sepia to chestnut brown, the darker areas represented by a broadly V-shaped marking mesad on each segment and lateral suffusions, the internal margins of which are oblique. Limbs sayal brown. Cephalic and median femora with a broad black area dorsad near the distal extremity. Cephalic tibia darkened in foraminal area. Caudal femora with a black area, twice as long as broad, dorso-proximad, and a black band of equal width running on the inner face from the median section of the enlarged portion to the extremity of that portion, where it curves dorsad, running over the dorsal face and half way down the external face.[28]

In the immature example the dark caudal femoral markings are confined to the dorso-proximal section, and a broad suffused blackish longitudinal band on the external face below the median line.

The measurements of the type are given first, followed by the extremes found in three paratypic males. Length of body, 19.5 mm., 13.7 to 17; length of pronotum, 4.4, 3.9 to 4.2; greatest width of pronotal disk, 3.2, 2.9–3.1; total width of pronotum, 4.3, 3.9 to 4.1; exposed length of tegmen, 4.4, 3.6 to 3.9; length of caudal femur, 14.7, 12.2 to 14 mm.

[23] In the type and the immature example at hand the median spine is missing on one of these margins.

[24] Individually varying to warm sepia.

[25] This shows the discal area to be of the same shape as in *Idionotus brunneus* Scudder, in which species the discal area is defined by lateral carinae throughout.

[26] Individually varying from a narrow line proximad to a suffusion covering half of the lateral lobes.

[27] Individually varying to warm sepia.

[28] In some specimens thence extending proximad on the external face as two suffused black lines.

In addition to the type, we have before us three paratypic males, bearing the same data, except that one was taken September 5, 1919. A small immature male is also at hand, taken near the upper meadows on Whitney Pass Trail, at an elevation of 10,700 feet, on September 6, 1919, by M. Hebard, near some small shrubs growing on a narrow slope of decomposed granite, at the foot of a twenty-seven hundred foot, south-facing precipice.

The typical series was taken in the open on steep decomposed granite sand slopes, overgrown with much sage and low thorny bushes. From the above data the species is found to range from the middle of the Western Yellow Pine (*Pinus ponderosa jeffreyi*) zone upward to near timber line in the zone of the Foxtail and Lodgepole Pines (*Pinus balfouriana* and *murrayana*).

ACRODECTES[29] new genus

This genus has no known close affinities. The character of the development leads us, however, to place it in linear arrangement immediately after *Idiostatus* Pictet. From that genus it is separated by the form of the vertex, which shows a distal depression, of the pronotum, which has a distinct transverse wrinkling and is less produced and in the male sex is slightly raised caudad,[30] the more fully exposed tegmina in both sexes, which show a different type of reduction, in the strong medio-longitudinal carina of the dorsal surface of the abdomen, the different general type of male genitalic development, in the ovipositor being non-serrate distad and the even greater reduction in the length of the distal spurs of the caudal tibiae, particularly of the median pair.

The genus is monotypic. Genotype.—*Acrodectes philopagus* here described.

Generic Description.—Size medium for the Decticinae, form elongate but robust, surface shining. Head with vertex rather broad, narrowing very weakly to the fastigio-facial suture, showing a slight depression on its surface dorso-distad. Pronotum short, with disk rounding evenly into the lateral lobes, except at the distinct latero-caudal shoulders, the surface transversely wrinkled, except in brief caudal produced portion; lateral lobes

[29] From ἄκρα = summit and δηκτης = a biter.

[30] In this feature some resemblance to the type developed in *Metrioptera sphagnorum* (Walker) is shown.

longer than deep, humeral sinus subobsolete, convex callosities obsolete. Tegmina reduced, the immediate base alone concealed by the pronotum in both sexes; in the male with entire stridulating field exposed. Dorsal surface of abdomen with a strong medio-longitudinal carina, this broken on the distal tergites. Male penultimate tergite specialized. Male cerci large and heavy with an internal tooth. Female with ovipositor elongate, almost straight, showing a very weak upward trend, smooth and polished except dorsal margin distad, which is very feebly furrowed with irregular oblique ridges; apex acute, median. Female subgenital plate simple. Prosternum unarmed. Limbs short and heavy. Cephalic coxae armed with a heavy spine. Femora with ventral margins armed with minute but stout spines. Cephalic tibiae with dorsal surface armed along external margin with three, sometimes four, stout spines. Caudal tibiae armed distad with three pairs of short heavy spurs, of which the dorsal pair are approximately as long as the heavier median pair. Plantula very small, scarcely longer than broad, about one-fourth the length of the metatarsus.

The character of the specialization of the male genitalia is distinctive among the Decticinae.

Acrodectes philopagus[31] new species (Pl. XI, figs. 1, 2, 3, 4, 5, 6 and 7.)

In addition to the numerous structural features which separate this remarkable insect from all other known forms of the Decticinae, the unusual black and tan type of coloration readily serves to distinguish the species.

Restricted in distribution to the bleak crags and rock piles, above timber line in the High Sierras, this species is of unusual interest to the student of biological development under as severe conditions as can be found in the United States.

Type—♂; Mount Whitney, Sierra Nevada, Fresno County, California. Elevation, 13,800 to 14,200 feet. September 7, 1919. (M. Hebard.) [Hebard Collection, Type no. 551.]

In addition to the features given in the generic description, we would note the following:

Size smaller than that of *Idiostatus hermanii* (Thomas). Head with vertex slightly wider than proximal antennal joint. Pronotum with latero-caudal shoulders of disk broadly rounded, the metazona moderately inflated caudad, so that the caudal margin is evenly convex in caudal aspect, caudal

[31] From φιλο-πάγος = a lover of the icy crags.

margin in dorsal aspect weakly concave. Tegmina, due to the brief production of the pronotum caudad and its convexity in that portion, fully exposed, approximately one and one-half times as long as the pronotum, stridulating field large, the tegmina beyond this point produced in latero-external portion, this area being longer than its proximal width, with margins converging to the very broadly rounded apex, in length less than that of the proximal section of the tegmina,[32] furnished with a coarse, irregular network of veins, among which the discoidal vein is heavier and direct, the median vein irregular and no heavier than the irregular cross-veins.

Penultimate tergite slightly more produced than preceding tergites, with a rather broad, percurrent, medio-longitudinal cleft, the cleft thus dividing this tergite into two similar sections which are movable, the cleft filled in its proximal two-thirds with a soft connecting integument, the distal margin of tergite transverse to the cleft. Supra-anal plate beneath deflexed between the cereal bases, short, shield-shaped with apex rounded. Cerci very large and heavy, straight, tapering very slightly to the heavy rounded apex, armed internally mesad with a very heavy erect tooth, two-thirds as long as remaining distal portion of cercus, vertical to shaft but with heavy apical spine curved slightly proximad, this tooth with proximal face armed with a number[33] of stout erect teeth, the internal surface of the shaft of the cerci, from this point proximad, deplanate with dorsal and ventral margins slightly raised and broadly rounded. Titillator represented by two similar processes, directed dorso-distad from the soft integument of the anal chamber, each chitinous, shaped like the blade of a short pen-knife, with edge dorsad armed with minute curved teeth. Subgenital plate with two rounded parallel carinae distad, the large styles situated in sockets at the apices of these, the distal portion of the free margin between rectangulate emarginate with apex rounded. Styles five times as long as proximal width, about two-thirds as long as the distance between their bases, straight, tapering slightly to the rounded apex.

Ventral margins of femora armed.[34] Genicular lobe very frequently supplied with a single minute spine[35] except the caudal genicular lobe of the cephalic femora which, apparently, is never armed. Caudal tibiae armed distad with three pairs of short heavy spurs, of which the longest is about half as long as the matatarsus.

Allotype—♀; same data as type, except that it was taken at 13,200 feet. [Hebard Collection.]

Agrees closely with male, except in the following features. Pronotum not inflated caudad, latero-caudal shoulders slightly more sharply rounded. Tegmina represented by elongate, lateral, rotundato-trigonal pads, in length slightly greater than that of pronotum, slightly over half as wide as long, the

[32] Varying in paratypes to very slightly longer than proximal section.

[33] Twelve or more.

[34] See details after table of measurements.

[35] In two examples a single genicular lobe bears two minute spines.

sutural margin oblique from point of greatest width to the rather broadly rounded apex; the venation represented by a coarse irregular network, in which the six principal veins, and particularly the discoidal (though somewhat irregular), are apparent. Medio-longitudinal carina of dorsal surface of abdomen decidedly weaker and interrupted in broader intervals distad than in male. Penultimate tergite much less ample and a much weaker development of the same type as found in that sex, the medio-longitudinal division being indicated only by a depression. Cerci small, elongate conical, slightly upcurved. Ovipositor much longer than caudal femur, showing a very faint upward curvature, apices of valves acute, median in position. Subgenital plate simple, convex, lateral margins strongly convex to meso-distal portion, the margin there deeply concave, the lateral apices thus formed broadly rounded.

General coloration shining black with conspicuous areas of reddish brown. Male type with head black, the face suffused with buckthorn brown. Pronotum black, with metanotum russet. Tegmina immaculate russet. Abdomen dorsad black, the caudal margin of the penultimate segment and internal surfaces of the cerci russet. Ventral surface of abdomen mars brown. Limbs with coxae and proximal half of femora black, remaining portions buckthorn brown, tinged with tawny distad, except foramina of cephalic tibiae which are black and feet which are suffused with blackish.

The female allotype is in every way similar except that the paler markings are all russet, the ovipositor alone shading to ochraceous-tawny proximad, the subgenital plate black, tawny meso-distad.

The series shows various degrees of recession in coloration. Two have the metanotum tawny, this running through the disk on the prozona and mesozona laterad of the median line. The tergites are each broadly margined caudad with tawny, the tips of the cerci entirely tawny and the black of the femora receding to the proximal two-fifths. In these the entire face is pale buckthorn brown to the caudal portions of the genae, while the subgenital plate is cinnamon brown.

Two other males show more decided recession, as follows. Occiput and lateral lobes of pronotum blackish carob brown (the former paler in one, cinnamon brown mesad), face clay color, remaining portions of pronotum cinnamon-brown shading to buckthorn brown caudad. Tegmina cinnamon-brown, abdomen dorsad buckthorn brown, finely tessellate with blackish, cerci buckthorn. Limbs buckthorn brown, with proximal portions of femora marked with black, this very weak on cephalic femora.

The immature individuals at hand agree fully in coloration with the intensively colored adults.

Measurements (in millimeters)

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
♂ Mt. Whitney, California, *type*	22.8	4.7	1.3	7.8	12.2

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Mt. Whitney, California, *paratypes*	20.2–24.4	4.2–5	4–4.8	6.6–8.6	11.7–12.4
Mono Pass, California	24	5	5.1	7.7	12.3
♀					
Mt. Whitney, California, *allotype*	21.7	5	4.1	6.5	13.7

The length of the ovipositor of the allotype is 18 mm.

The armament of spines of the ventral femoral margins is as follows, that for the type given first, followed by the extremes for the series. Cephalic femur, ventro-cephalic 3 and 5, 3 to 6; ventro-caudal 1 and 3, 0 to 3; median femur, ventro-cephalic 3 and 3, 1 to 6; ventro-caudal 1 and 2, 0 to 4; caudal femur, ventro-external 4 and 7, 1 to 8; ventro-internal 3 and 5, 2 to 10.

In addition to the described pair, five adult males are before us, bearing the same data, except that one was taken on the southwestern slope of Mount Muir (a spur of Whitney Ridge) at 13,100 feet, and one at the highest point in the United States, the summit of Mount Whitney, 14,500 feet. These we designate as paratypes.

We have, moreover, a pale colored adult male, taken at Mono Pass, California, at 10,600 feet; a third grown immature male from the summit of Mount Whitney, taken on August 12, 1908; a nearly adult female taken on the Kern-Kaweah Divide, Tulare County, California, at 12,000 feet, on July 12, 1910, by W. Colby, and one smaller immature female taken on Mount Rixford Ridge, Fresno County, California, at 12,000 feet, on August 12, 1914, by F. Grinnell, Jr. Of this series, all are in the Philadelphia Collections except the first mentioned immature male and female, which are the property of the California Academy of Sciences. All of the localities are in the southern Sierra Nevada Mountains.

The following field notes were made. "These remarkable insects live among the granite boulders and slabs, where there is no vegatation whatever, except small quantities of blackish lichens. With the lichens they harmonize, but a few looked conspicuously black on the grayish granite where they were found. Some were found on the decomposed granite sand in chinks of the enormous rock slides, while frequently males were perched on the upper edge of granite boulders, stridulating in the sunlight. A high

and very cold wind was blowing and their bodies were stone cold. The males, however, stridulated vigorously—dzit-zit dzit-zit dzit-zit—a harsh and nervous sounding note, which was discontinued instantly if one approaching was heard or seen, no matter if twenty feet away. The males, when they thus discontinued stridulating, however, were easily taken, as they would remain motionless until suddenly seized, if the hand approached with caution after a reasonably careful advance had been made. Individuals not stridulating were alert and would at once make for some crack under a granite boulder, by clumsy and short but hurried leaps. The species was found in small numbers on the southwestern slope of Mount Whitney at 13,800 to 14,200 feet, elsewhere it was very scarce."

EXPLANATION OF PLATES

Plate VIII

Fig. 1.—*Aglaothorax segnis* new species. Crestline, Nevada. Male. *Type*. Dorsal view of pronotum. (×2.)

Fig. 2.—*Aglaothorax armiger* new species. Lee Canyon, Spring Mountains, Nevada. Male. *Type*. Dorsal view of pronotum. (×2.)

Fig. 3.—*Aglaothorax segnis* new species. Crestline, Nevada. Male. *Type*. Cercus (from dorsum). (Greatly enlarged.)

Fig. 4.—*Aglaothorax armiger* new species. Lee Canyon, Spring Mountains, Nevada. Male. *Type*. Dorsal view of apex of abdomen. (Greatly enlarged.)

Fig. 5.—*Rehnia cerberus* new species. Marathon, Texas. Male. *Type*. Stridulating field of left tegmen. (×4.)

Fig. 6.—*Rehnia sinaloae* new species. Venvidio, Sinaloa, Mexico. Male. *Type*. Stridulating field of left tegmen. (×4.)

Fig. 7.—*Rehnia cerberus* new species. Marathon, Texas. Male. *Type*. Dorsal view of apex of abdomen. (Greatly enlarged.)

Fig. 8.—*Rehnia sinaloae* new species. Venvidio, Sinaloa, Mexico. Male. *Type*. Dorsal view of apex of abdomen. (Greatly enlarged.)

Plate IX

Fig. 1.—*Aglaothorax segnis* new species. Crestline, Nevada. Male. *Type*. Lateral outline of pronotum. (×2.)

Fig. 2.—*Aglaothorax armiger* new species. Lee Canyon, Spring Mountains, Nevada. Male. *Type*. Lateral outline of pronotum. (×2.)

Fig. 3.—*Aglaothorax armiger* new species. Lee Canyon, Spring Mountains, Nevada. Female. *Allotype*. Lateral outline of ovipositor and subgenital plate. (×2¼.)

Fig. 4.—*Rehnia cerberus* new species. Marathon, Texas. Male. *Type*. Lateral view of pronotum. (×3.)

Fig. 5.—*Rehnia sinaloae* new species. Venvidio, Sinaloa, Mexico. Male. *Type*. Lateral view of pronotum. (×2.)

Fig. 6.—*Rehnia cerberus* new species. Female. *Allotype*. Lateral outline of ovipositor. (×1½.)

Fig. 7.—*Rehnia sinaloae* new species. Venvidio, Sinaloa, Mexico. Female. *Allotype*. Lateral outline of ovipositor. (×1½.)

Fig. 8.—*Pediodectes daedalus* new species. Uvalde, Texas. Male. *Type*. Dorsal view of penultimate tergite. (Greatly enlarged.)

Fig. 9.—Same. Dorsal view of cercus. (Greatly enlarged.)

Fig. 10.—*Pediodectes daedalus* new species. Uvalde, Texas. Female. *Allotype*. Lateral view of ovipositor. (×1½.)

Fig. 11.—Same. Lateral view of distal portion of ovipositor. (Greatly enlarged.)

Fig. 12.—*Anabrus spokan* new species. Sand Point, Idaho. Male. *Type*. Dorsal view of cercus. (Greatly enlarged.)

Fig. 13.—Same. Dorsal outline of pronotum. (×2.)
Fig. 14.—Same. Lateral outline of pronotum. (×2.)
Fig. 15.—*Anabrus spokan* new species. Sand Point, Idaho. Female. *Allotype*. Lateral view of ovipositor. (×1½.)

Plate X

Fig. 1.—*Oreopedes cryptoptera* new species. Silver Canyon Trail, White Mountains, Inyo County, California. 8200 to 8300 feet. Male. *Type*. Dorsal outline of pronotum. (×2.)
Fig. 2.—Same. Lateral outline of pronotum. (×2.)
Fig. 3.—Same. Dorsal view of penultimate tergite. (Greatly enlarged.)
Fig. 4.—Same. Dorsal view of cercus. (Greatly enlarged.)
Fig. 5.—Same. Lateral view of disto-external portion of caudal tibia. (Greatly enlarged.)
Fig. 6.—*Idiostatus inyo* new species. Near Owen's Lake, Inyo County, California. Male. *Type*. Lateral view of pronotum and tegmen. (×4.)
Fig. 7.—Same. Dorsal view of penultimate tergite. (Greatly enlarged.)
Fig. 8.—Same. Dorsal view of cercus. (Greatly enlarged.)
Fig. 9.—*Idiostatus callimera* new species. Lone Pine Canyon, Sierra Nevada Mountains, Inyo County, California. 8400 feet. Male. *Type*. Lateral outline of pronotum. (×2.)
Fig. 10.—Same. Dorsal view of pronotum and tegmina. (×4.)
Fig. 11.—Same. Dorsal view of penultimate tergite and supra-anal plate. (Greatly enlarged.)
Fig. 12.—Same. Dorsal view of cercus. (Greatly enlarged.)

The supra-anal plate is visible from above in this species, as shown. It is concealed from this aspect in *Oreopedes cryptoptera* and *Idiostatus inyo*.

Plate XI

Fig. 1.—*Acrodectes philopagus* new species. Mount Whitney, California. 13,800 to 14,200 feet. Male. *Type*. Lateral view. (×3.)
Fig. 2.—Same. Dorsal view of penultimate tergite. (Greatly enlarged.)
Fig. 3.—Same. Dorsal view of cercus. (Greatly enlarged.)
Fig. 4.—Same. Dorsal view of pronotum and tegmina. (×4.)
Fig. 5.—*Acrodectes philopagus* new species. Mount Whitney, California. 13,200 feet. Female. *Allotype*. Lateral view of ovipositor. (×2.)
Fig. 6.—Same. Dorsal view of pronotum and tegmina. (×4.)
Fig. 7.—Same. Lateral view of distal partion of ovipositor. (Greatly enlarged.)

KEY TO THE NEARCTIC SPECIES AND VARIETIES OF ERYTHRONEURA

(HOMOPTERA; EUPTERYGIDAE)

BY W. L. MCATEE

The present treatment of the genus *Erythroneura* Fitch differs from the preceding revision, that of Gillette in 1898,[1] in the following points: the genus is recognized as distinct from *Typhlocyba* Germar[2] and the species, all of which Gillette included in the latter group, are distributed according to their characters; two species referred to other genera are omitted (*Empoa coccinea* Fitch to *Empoasca*, fide Van Duzee and Ball, and *Typhlocyba sanguinea* Gillette and Baker to *Dikraneura*, fide Van Duzee); the composite species *Typhlocyba comes* Say (embracing forms with three different types of venation, not to speak of radically different color patterns) is divided into six species and probably should be further subdivided; and four new species and thirty-eight new varieties are described.

Some reference is made to every Nearctic form in the literature, except *Erythroneura rubricata* Van Duzee which I have not seen. It may be mentioned here that *Typhlocyba tunicarubra* Gillette and *Empoa albicans* Walsh, forms about which there might otherwise be some question, belong to the genus *Typhlocyba* s. s.

Erythroneura is the most intricate of the Nearctic *Eupterygidae*, in the relations of its species and especially of its color varieties, and in making determinations all characters require attention. First as to recognition of the genus: there are no anteapical cells in the tegmen, and the membrane is not appendiculate; there is no submarginal vein in the wing, and there are two apical wing cells, the first and second wing-veins being confluent. Finally separating it from *Typhlocyba*, which agrees with it to this point, the fourth (inner) apical vein of tegmen terminates in

[1]Proc. U. S. Nat. Mus. xx, pp. 750 to 773.

[2]For discussion of this subject see Proc. Biol. Soc. Wash., xxxi, pp. 109 to 124, Nov. 29, 1918.

the apical margin and the second apical cell is oblong and based on a cross-vein. In *Typhlocyba* the fourth apical vein is curved, terminating in radial margin, and the second apical cell is triangular, sometimes even stalked. In the identification of species the character of the fourth apical cell, the shape of vertex and the color pattern appear to be the most important external characters. The differences between groups are more or less bridged by fluctuations in this extremely variable genus. On this account it may be necessary to run some specimens through the keys of both Groups 4 and 5 as subsequently defined. The species are not numerous, and as aggregates are easily recognizable after a little experience, but variation is so great that it is difficult if not impossible to construct a synopsis, subject to so few exceptions, that identification of chance individuals will be easy and certain. Numerous new varieties are named in the present paper, and the policy governing such naming will be only briefly expressed here.[3] Insects have varieties, different from the subspecies of ornithology and mammalogy that seem to require recognition in nomenclature; they have others which should not be named. Conspicuous examples of the latter type or mere color phases, are the varying red to yellow forms of *Erythroneura*. Where the color pattern is the same but a transition in color occurs, as from yellow to red, or from red to black, I have endeavored to avoid nomenclatorial recognition of the variants. However where the color pattern differs, in shape, notably in extent, or otherwise in any essential way the variety has been named. The writer believes the accumulation of knowledge relating to these varieties will be retarded if not prevented, by lack of means of referring to them in entomological literature, in other words, of names.

The system of measurements used in this paper is intended to enable the student, if he so desires, to draw an approximately accurate outline of each form. Total length of the specimen measured is given in units and hundredths of millimeters; all of the other measurements are ratios or readings from an eyepiece micrometer each division of which has, with the magnification used,

[3] A paper especially devoted to this subject is in Entomological News, XXXI, No. 2, Feb. 1920, pp. 47-55, and No. 3, March, 1920, pp. 61-65.

a value of .033 mm. in the focal plane. The measurements or ratios given are median length of vertex (LM), length straight across vertex from anterior angle of eye (LE), width between anterior angles of eyes (WA), greatest width of head (WP), distance from median point of posterior margin of vertex to anterior angle of eye (OA), from same point to posterior angle of head (OP), from same point to posterior angle of pronotum (OH), median length and greatest width of pronotum, and distance from humeral angle of tegmen to point nearest apex of scutellum and from thence to apex of tegmen. Unless otherwise stated measurements are from type specimens.

Key to the Groups of Species

For the purposes of this key, and throughout the paper, the apical cells and cross-veins of tegmina are given numbers, in order according to their position from costal to radial margin. The cross-veins are, respectively: one, between costal margin and first sector; two, between first and second sectors; three, between second and third sectors; and four, between third sector and radial margin.

A. Normally the third sector and third apical vein are not continuous, a portion of the angulate or curved third cross-vein being interposed between them, the fourth apical cell, therefore, being angulate or curved at base. (Figs. 7 to 10.)

B. Normally the base of the fourth apical cell is distinctly angulate. (Figs. 7, 9, 10.)

C. Second apical cell distinctly shorter than third, and a fourth or more shorter than fourth apical cell (fig. 7); vertex rather long and pointed. (Fig. 5.) ..... Group 1

CC. Second apical cell about the same length as third; not a fourth shorter than fourth. (Figs. 9, 10.)

D. Normally half or more of third cross-vein bordering fourth apical cell, which is unusually wide and lacks a black dot near base. Group 3

DD. Normally less than half of third cross-vein borders fourth apical cell, which is narrower and almost invariably is black or has a black dot at base ..... Group 4

BB. Normally the base of the fourth apical cell is a smoothly curved line (fig. 8); vertex of medium length and acuteness (fig. 4) ..... Group 2

AA. Normally the third sector and the third apical vein are continuous, and the fourth apical cell is merely oblique or rectangular at base. (Figs. 11, 12.)

B. Fourth cross-vein normally oblique, joining radial margin so that posterior angle formed by their juncture is less than a right angle (fig. 11); apex of second apical cell not marked with black ..... Group 5

BB. Fourth cross-vein normally in line with or parallel to third, and joining radial margin approximately at right angles (fig. 12); apex of second apical cell black or with a black spot..... GROUP 6

Key to the Species by Groups

GROUP 1

A. Consists of a single species, which in all its color forms, retains traces at least of a narrow median pale vitta on vertex, pronotum and scutellum. **E. vulnerata** Fitch, p. 272.

GROUP 2

A. Tegmina hyaline, or color markings when present chiefly longitudinal, consisting of oblique vittae, which in some varieties are fused into broad stripes..... **E. obliqua** Say, p. 275.

AA. Principal color markings transverse, or occupying nearly all of tegmina to cross-veins.

B. An oblique cross-band at about middle of tegmen; scutellum, and more or less of thorax red..... **E. rubroscuta** Gillette, p. 282.

BB. Dorsal surface chiefly occupied by a reddish saddle spot (dusky within) which extends to apex of clavus on the median line, but only to the middle along costa..... **E. crevecoeuri** Gillette, p. 283.

GROUP 3

A. Vertex very short, nearly as long at inner margin of eye as at middle (fig. 1); vertex and scutellum each with two distinct dark dots. **E. bipunctata** Gillette, p. 283.

AA. Vertex distinctly longer at middle than along inner margin of eye (figs. 2, 3), without dark dots.

B. Length 3.8 to 4.5 mm.; vertex long but bluntly rounded (fig. 2); color clear pale yellow..... **E. ador** McAtee, p. 284.

BB. Smaller species; vertex not so long nor so blunt (fig. 3).

C. Genital plate of female ending in a broad, notched process; tegmina stramineous with orange-yellow vittae; western species. **E. dentata** Gillette, p. 285.

CC. Genital plate of female, and coloration of tegmina chiefly otherwise; eastern species..... **E. abolla** new species, p. 285.

GROUP 4

A. Vertex rather bluntly rounded (fig. 6); clavus roof-shaped when at rest; basal triangles of scutellum and two dots on vertex black. **E. tecta** new species, p. 288.

AA. Vertex more pointed (figs. 3, 4, 5); other characters not agreeing with the preceding.

B. Vertex very pointed (fig. 5); a broad dark stripe the whole length of the insect, black on vertex, pronotum and scutellum and smoky brown on tegmina..... **E. aclys** new species, p. 290.

BB. Vertex less pointed (figs. 3,4), coloration otherwise.
C. Chief color markings small black or red dots; black dots in base of fourth apical cell, one on middle of costa and another on corium near middle of clavus, the latter usually ocellate with red.
E. illinoiensis Gillette, p. 290.
CC. Chief color markings not small black or red dots.
D. Tegmina with a complete transverse dark band, or chiefly red with a large pale discal spot.
E. Broad band across tegmina at cross-veins and posterior half of thorax smoky to black..... **E. morgani** DeLong, p. 292.
EE. Tegmina chiefly red with a large discal pale spot.
E. hartii Gillette, p. 293.
DD. Tegmina otherwise; scutellum, adjacent parts of thorax, and sometimes more or less of head smoky to black.
E. scutelleris Gillette, p. 294.

GROUP 5

A. Posterior half of pronotum, scutellum and anterior third of tegmina yellow, pink or sanguineous..... **E. basilaris** Say, p. 294.
AA. Coloration otherwise.
B. Color pattern, when present (hyaline varieties exist), made up chiefly of red, sanguineous or yellow irregular spots, some of which in varieties are more or less fused..... **E. maculata** Gillette, p. 296.
BB. Chief color markings, zigzag scarlet vittae from scutellum to cross-veins..... **E. ligata** new species, p. 301.

GROUP 6

A. Nearly the whole upper surface smoky brown to black.
E. infuscata Gillette, p. 302.
AA. Upper surface colored otherwise.
B. Upper surface with a large red saddle-spot, with red to dusky cross-bands, or chiefly red.
C. Anterior cross-band covering bases of tegmina.
E. vitis Harris, p. 303.
CC. Anterior cross-band not covering bases of tegmina.
E. tricincta Fitch, p. 306.
BB. Upper surface nearly colorless, or with a color pattern consisting of irregular red to yellow spots of which three (the upper two sometimes fused) are on clavus, and those on corium tend to be arranged in three oblique series; these markings sometimes fused into red to dusky angulate vittae; dorsum sometimes ornamented by black spots.
E. comes Say, p. 310.

Erythroneura vulnerata Fitch

E. [*rythroneura*] *vulnerata*, Fitch, Asa. Catalogue, with References and Descriptions of the Insects Collected and Arranged for the State Cabinet of Natural History. Fourth Annual Report of the Regents of the University of the State of New York on the State Cabinet of Natural History, 1851, pp. 62–63. Reprint J. A. Lintner, Ninth Report on Insects of New York, 1893, pp. 402–403. [New York.][4]

This species is quite distinct from the other Nearctic forms; it is especially characterized by the short second apical cell, by the angulate base of the fourth apical cell (fig. 7) and the rather sharply pointed vertex (fig. 5). It has a number of color varieties, the details of coloration that come nearest to occuring in all specimens being the pale median line, which in its typical development is percurrent over vertex, pronotum and scutellum, the pale cross-veins and dark apical cells, hyaline at tip, and with a hyaline band near apex across at least the fourth cell.

The known range of E. *vulnerata*, as a whole, extends from Quebec, Ontario and Colorado south to Virginia, Texas and Arizona.

Key to the Color Varieties

A. Clavus with conspicuous pale areas other than a single large spot.
  B. Tegminal color markings chiefly smoky brown to black, pale areas conspicuous by contrast..... var. **decora** new variety, p. 274.
  BB. Tegminal color markings otherwise, pale areas less conspicuous.
    C. Markings of scutellum and anterior parts about the same color as those of tegmina.
      D. Tegminal color markings greenish brown to fulvous.
        var. **vulnerata** Fitch, p. 273.
      DD. Tegminal color markings yellowish red to maroon.
        var. **vulnerata** Fitch, red form, p. 273.
    CC. Markings of scutellum and anterior parts smoky to black; of tegmina vivid maroon..... var. **fulmina** new variety, p. 274.
AA. Clavus with inconspicuous pale areas, except sometimes a large basal spot; smoky brown to black varieties.
  B. Clavus with a single large whitish-yellow basal spot.
    var. **niger** Gillette, p. 274.
  BB. Clavus with only inconspicuous semi-hyaline pale areas.
    var. **nigerrima** new variety, p. 275.

[4] References given in full the first time cited, abbreviated thereafter.

Erythroneura vulnerata var. **vulnerata** Fitch

Bibliographical citation same as for species.

In this description the "color markings" of the key are assumed to be the ground color. In variety *vulnerata* this varies from greenish brown to fulvous and is relieved by the following pale areas and color markings; anterior margin of vertex, a vitta bordering each eye, and a median vitta expanded in front which is more or less continuous over vertex, pronotum and scutellum; pronotum with a curved pale vitta and interior pale spot on each side, scutellum often pale yellowish or reddish laterally, clavus with a large irregularly lunate whitish hyaline spot on inner side at base, sometimes divided and a smaller one beyond middle; corium whitish hyaline between sectors, a well defined spot near posterior claval spot; costal plaque opaque whitish, marked off at each end by an oblique dark line; middle part of costal margin narrowly yellow, a pale area behind costal plaque and of about the same color interrupted posteriorly by red streaks on the first cross-vein and first sector; other cross-veins, apical veins and the sectors more or less pale; apical cells and adjacent tegminal surface the other side of cross-veins, smoky to black, crossed near apex by an oblique hyaline band, second cell with an additional hyaline spot near base, and the first chiefly hyaline within. Underside chiefly slaty, upper part of face livid to yellowish, legs stramineous to yellow, edge of abdomen pale yellow.

Length, 2.97 mm.; vertex: LM 7.5, LE 3, WA 12, WP 21, OA 6, OP 11.5, OH 16; pronotum: L 11, W 21; tegmen 14–61. Measurements from a female collected at Plummer's Island, Maryland, July 19, 1914, (W. L. McAtee).

Other specimens (2.64 to 3.03 mm.) examined were collected at Odenton, Laurel, Beltsville and Plummer's Island, Maryland; Washington, District of Columbia, Virginia and Denver, Colorado. [Collections of U. S. National Museum and of W. L. McAtee.]

Erythroneura vulnerata var. **vulnerata** Fitch, red form

Distribution and relative extent of color markings and pale areas, about as in variety *vulnerata*, but the color markings decidedly reddish (bright red to maroon).

Length, 2.8 mm.; vertex: LM 7, LE 3, WA 10, WP 17, OA 5.5, OP 10, OH 15; pronotum: L 10, W 20; tegmen 12–58. Measurements from a female, Plummer's Island, Maryland, Nov. 4, 1906, (W. L. McAtee).

Other specimens (2.3 to 3.03 mm.) examined were collected at Riverdale and Plummer's Island, Maryland; Washington and Anacostia, District of Columbia; Dead Run, Virginia; Long Island, New York and Denver, Colorado. [W. L. M., U. S. N. M.]

Specimens from the west, which may prove, ultimately, to deserve subspecific recognition, have the pale areas of the tegmina notably more extensive, and the color markings yellowish to orange-red; underside much paler, face and genitalia sometimes entirely pale yellow.

Length, 2.83 mm.; vertex: LM 8, LE 3.5, WA 13, WP 20.5, OA 6.5, OP 12, OH 16; pronotum: L12, W 21; tegmen 13–56. Measurements from a female; Riley County, Kansas, July, [U. S. N. M.]

Other specimens (2.7 to 2.83 mm.) from Riley County, Kansas; Wichita Falls and Victoria, Texas, and Higley and Graham Mountains, Arizona. [U. S. N. M., Biological Survey.].

Erythroneura vulnerata var. **fulmina** new variety

Scutellum and anterior parts with color markings chiefly smoky to black, pale areas much reduced; tegmina with ground color opaque whitish, color markings pinkish to maroon, ground color of apical cells black. A most beautiful variety, the dark fore and hind parts contrasted with the paler mid-section, the latter in turn colored with beautifully contrasting milky white and dark red, the costa flushed and the sectors and first cross-vein dotted with bright pinkish red.

Length, 2.97 mm.; vertex: LM 7, LE 3, WA 12, WP 20.5, OA 6, OP 12.5, OH 16.; pronotum: L 11, W 21; tegmen 13–63.

Type—♀; Plummer's Island, Maryland, January 6, 1907, (A. K. Fisher), [W. L. M.]. Allotype—♂; same data.

Erythroneura vulnerata var. **decora** new variety

Color markings smoky to black, pale areas conspicuous by contrast, and much larger than in variety *vulnerata*, vertex pale yellow with two broad black vittae inclosing a narrow median pale one, pronotum with median and two discal pale yellow spots, sometimes merged, spots and dashes of same color near lateral and anterior margins; median scutellar vitta broad and basal triangles paler within; tegminal pale areas large, that on base of clavus conspicuous, pale yellow; costal plaque pale yellow.

Length, 2.83 mm.; vertex: LM 7, LE 3, WA 12, WP 18.5, OA 6, OP 11, OH 16; pronotum: L 10.5, W 20; tegmen 12–58.

Type—♀; Plummer's Island, Maryland, May 9, 1913, (W. L. McAtee), [W. L. M.]. *Paratypes*—same locality, June and November, (W. L. M.).

Erythroneura vulnerata var. **niger** Gillette

Typhlocyba vulnerata var. *niger*. Gillette, C. P. American Leaf-hoppers of the Subfamily Typhlocybinae. Proceedings of the U. S. National Museum, xx, 1898, p. 765. [Type No. 3452, U. S. N. M., which is labelled Washington, D. C.]

Typhlocyba nigridorsum. De Long, D. M. The Leafhoppers or Jassoidea of Tennessee. Bul. No. 17, Tennessee State Board of Entomology, June, 1916, p. 110. [Clarksville, Tennessee.]

Color above chiefly smoky brown to black, vertex and pronotum each with a median streak and two discal spots, or the latter wanting, and scutellum with a median streak, pale yellow; pale areas of tegmina much reduced, a large spot at inner side of base of clavus and the costal plaque pale yellow, or the latter opaque whitish.

Length, 2.73 mm.; vertex: LM 7.5, LE 3, WA 12, WP 18.5, OA 6, OP 11, OH 15; pronotum: L 10, W 19; tegmen 11–56.

Specimens other than the type examined were collected at Plummer's Island, Seven Locks and Beltsville, Maryland, and at Falls Church, Virginia, (W. L. McAtee), (W. L. M.).

Erythroneura vulnerata var. **nigerrima** new variety

A darker form even than variety *niger*, the pale areas on clavus being smaller, semi-hyaline and inconspicuous; in extreme examples there is only a single pale point at two-thirds length of clavus, and one on corium near it, besides the pale yellow costal plaque and paler costal area just posterior.

Length, 2.64 mm.; vertex: LM 6, LE 3, WA 10.5, WP 17, OA 5.5, OP 10, OH 15; pronotum L 10, W. 19; tegmen 13–54. Measurements taken from a female paratype; Maryland, near Plummer's Island, June 17, 1913, (W. L. McAtee).

Type—♀ (about 2.14 mm.); Maywood, Alexandria County, Virginia, February 20, 1916, (W. L. McAtee), [W. L. M.]. *Paratypes*—Plummer's Island, Maryland, June and November, [W. L. M.]; Fort Washington, Maryland, and Washington, District of Columbia, [U. S. N. M.].

Erythroneura obliqua Say

T. [*ettigonia*] *obliqua*. Say, Thomas. Descriptions of new Hemipterous Insects collected in the Expedition to the Rocky Mountains, performed by order of Mr. Calhoun, Secretary of War, under command of Major Long. Journal of the Academy of Natural Sciences of Philadelphia, iv, 1825, p. 342; The Complete Writings of Thomas Say on the Entomology of North America, Vol. II, 1859, p. 259. [Engineer Cantonment on the Missouri.]

This species and the following two forms, which may prove to be no more than varieties of it, constitutes a group, easily recognizable among Nearctic *Erythroneura* by the broad fourth apical cell with smoothly curved base which joins radial margin at a very acute angle (fig. 8); in addition practically all of the individuals of the group have, in some form, two strong posteriorly diverging longitudinal color vittae on vertex, which are often continued on pronotum.

The known range of *E. obliqua* extends from Quebec, Ontario and Colorado to Virginia, Louisiana and California. The single previously published California record[5] is supported, to a degree, by the locality of var. *aucta* hereafter described, which, however,

[5] Gillette, Am. Typhlocybinae, 1898, p. 757.

may prove to be a distinct species. At any rate, information is much needed relating to the status of *E. obliqua* west of the continental divide.

Key to the Color Varieties

A. Color markings present.
  B. Color markings more or less run together, especially on vertex and pronotum, forming a dorsal stripe.
    C. Stripe on tegmina confined to clavi, which are red, the remainder of tegmina being sulphur yellow. . . . var. **clavata** DeLong, p .278.
    CC. Stripe on tegmina otherwise.
      D. Stripe on tegmina, not of uniform width, obviously made up of two heavy vittae, the claval and corial.
        E. Stripe chiefly red on head and pronotum.
          var. **dorsalis** Gillette, p. 278.
        EE. Stripe chiefly dark on head and pronotum.
          var. **dorsalis** Gillette, dark form, p. 279.
      DD. Stripe on tegmina continuous, more nearly of uniform width.
        E. Stripe dusky to black throughout.
          var. **stolata** new variety, p. 279.
        EE. Stripe bright red along margins, duskier red within.
          var. **aucta** new variety, p. 279.
  BB. Color markings chiefly in the form of distinct vittae.
    C. Scutellum dark or with dark markings.
      D. Scutellum with two black triangles at base.
        var. **parma** new variety, p. 280.
      DD. Scutellum and sometimes adjacent parts of thorax smoky to black.
        E. Tegminal vittae chiefly red. . . . var. **noevus** Gillette, p. 280.
        EE. Tegminal vittae chiefly yellow.
          var. **noevus** Gillette, yellow form, p. 280.
    CC. Scutellum without dark markings.
      D. Dorsum of abdomen usually dark or with a distinct dark blotch showing through the tegmina, ground color of scutellum and pronotum also, often darker.
        E. Dusky markings, if any, on tegmina, in form of cross-bands; apical cells entirely dusky.
          F. Tegminal vittae red; apical cells often very dark.
            var. **fumida** Gillette, p. 281.
          FF. Tegminal vittae yellow.
            var. **fumida** Gillette, yellow form, p. 282.
        EE. Tegmina with broad longitudinal dusky vittae; third and fourth apical cells abruptly hyaline.
          var. **electa** new variety, p. 282.
      DD. Dorsum of abdomen usually pale; ground color of scutellum and pronotum paler.
        E. Scutellum chiefly deep orange. . var. **pelta** new variety, p. 278.

EE. Scutellum otherwise.
F. Color markings red ..... var. **obliqua** Say, p. 277.
FF. Color markings yellow to pellucid or livid.
var. **obliqua** Say, yellow form, p. 277.
AA. Color markings nearly or entirely absent.
var. **eluta** new variety, p. 277.

Erythroneura obliqua var. **obliqua** Say

Bibliographical references same as for species.

Ground color of scutellum and anterior upper surface pale opaque yellow, markings two orange-red vittae connivent on vertex, forming an inverted V-shaped mark common to vertex and pronotum; scutellum with median pale yellow opaque vitta, bordered by two narrow orange red lines, tip orange red. Tegmina whitish hyaline, bearing orange-red markings as follows: vitta on clavus interrupted except for dots near radial margin, then continued along that margin nearly to tip of clavus; a long vitta along third sector, curved at apex along part of base of fourth apical cell; narrow stripe along anterior half or more of costal margin; thread of color along first sector, and sometimes along cross-veins; apical cells slightly yellowish smoky; costal plaques greenish yellow. Ground color below pale yellow, stripe along pleura pale reddish; arcuate cross-band on lower surface of vertex and touches of color elsewhere on face, orange-yellow to red; fore tibiae washed with reddish; claws black.

Length, 3 mm.; vertex: LM 8, LE 3.5, WA 12, WP 17, OA 8, OP 11, OH 15; pronotum: L 11, W 18; tegmen 14–61. Measurements from a female; Plummer's Island, Maryland, Nov. 30, 1913, (W. L. McAtee).

Other specimens (2.6 to 3.1 mm.) examined were collected at Plummer's Island, Bladensburg and Branchville, Maryland; Dead Run, Maywood and Mount Vernon, Virginia, and Iowa City, Iowa, (W. L. M.): Washington, District of Columbia; Clarksville, Tennessee, and Opelousas, Louisiana, [U. S. N. M.].

Erythroneura obliqua var. **obliqua** Say, yellow form

Color pattern as in the red form, but with the color markings varying from yellow through light-greenish-yellow to pellucid or livid; tegmina more hyaline; costal plaques whitish usually obscured by the color markings.

Length, 2.8 mm.; vertex: LM 7, LE 3.5, WA 12, WP 17, OA 6, OP 10.5, OH 14; pronotum: L 11, W 19; tegmen, 13–59. Measurements from a female; Plummer's Island, Maryland, April 27, 1913, (W. L. McAtee).

Other specimens examined were collected at Plummer's Island, Odenton, Laurel, and Beltsville, Maryland; Anacostia, District of Columbia; Bluemont, Great Falls, Maywood and Glencarlyn, Virginia, and Oxford, Indiana, (W. L. M.).

Erythroneura obliqua var. **eluta** new variety

Scutellum and anterior parts and under surface pale yellowish; tegmina whitish hyaline.

Length, 3.03 mm.; vertex: LM 6.5, LE 3.5, WA 12, WP 19.5, OA 7, OP 10, OH 16; pronotum: L 11, W 21; tegmen 15–62.

Type—♀; Oxford, Indiana, Nov. 1, 1914, (W. L. McAtee), [W. L. M.]. Paratypes—(2.9 to 3.1 mm.) same data; Dunn-Loring, Virginia, August 30, 1916; Scott's Run to Balls Hill, Virginia, August 12, 1917, (W. L. McAtee), [W. L. M.].

Erythroneura obliqua var. **pelta** new variety

Differs from the yellow form of the typical variety in having the scutellum (except pale median vitta and basal triangles), and mesopleurae deep orange and the longitudinal color vittae somewhat deeper yellow.

Length, 2.7 mm.; vertex: LM 6, LE 3, WA 12, WP 18; OA 6.5, OP 11.5, OH 16; pronotum L 11, W 20; tegmen 17–55.

Type—sex unknown (abdomen missing); Plummer's Island, Maryland, June 8, 1913, (W. L. McAtee), [W. L. M.].

Erythroneura obliqua var. **clavata** De Long

Typhlocyba obliqua var. *clavata*. De Long, D. M. Jassoidea of Tennessee. Bull. 17, Tenn. State Bd. Ent., June, 1916. [Clarksville, Tennessee.]

Markings of vertex and pronotum similar to those of var. *obliqua* but heavier, scutellum chiefly, and clavi entirely, bright red, the remainder of tegmina uniform sulphur-yellow to apical area, which is milky white to pale yellow.

Length, 3.06 mm.; vertex: LM 6.5, LE 4, WA 12, WP 20.5, OA 7, OP 12, OH 17.5; pronotum: L 11.5, W 23; tegmen 15–62. Measurements from the type specimen, very kindly loaned by Mr. D. M. De Long, who collected it at Clarksville, Tennessee, June 29, 1915.

Erythroneura obliqua var. **dorsalis** Gillette

Typhlocyba obliqua var. *dorsalis* Gillette, C. P. Am. Typhlocybinae, 1898, p. 757. ["Many localities."]

Gillette states that: "Variety *dorsalis*, new variety has the red markings so run together as to form a continuous red or dark (sometimes almost black) dorsal stripe the entire length of the insect." No type was designated and no locality mentioned. The varietal name *dorsalis* Gillette, therefore, is hereby restricted to the form of *obliqua* in which the typical *red* vittae are so broadened and run together as to form a practically continuous stripe. Other varieties with longitudinal stripes not answering to this description are mentioned in succeeding paragraphs.

In its best development variety *dorsalis* has the head and pronotum, except narrow lateral margins and the scutellum and clavi, entirely covered by a broad continuous red stripe; the corial vittae are unusually broadened, originate about middle of corium and are cut sharply off at cross-veins; apical

cells dusky. The principal variations are that narrow slaty-drab vittae and edgings may mark the places where more extensive pale areas are present in variety *obliqua,* or the tegminal vittae may be well separated as in typical form; the inner apical cells are quite black sometimes, continuing the dorsal stripe to apices of tegmina.

Length, 2.57 mm.; vertex: LM 7, LE 3.5, WA 12, WP 18, OA 6, OP 10, OH 14; pronotum: L 10, W 18; tegmen 12–53. Measurements from a female; Hutchinson, Kansas, Oct. 23, 1914, [U. S. N. M.].

Other specimens examined are from Plummer's Island, and Branchville, Maryland; Mount Vernon, Virginia; Oxford, Indiana, and Clarksville, Tennessee, [W. L. M., U. S. N. M.].

Erythroneura obliqua var. **dorsalis** Gillette dark form

Like *dorsalis* except that the dorsal stripe is black on head, pronotum and scutellum, remaining red or reddish, at least in part, on tegmina. This is a very pretty variety as the black anterior part of the stripe is strongly contrasted with pale yellow margins from humeri forward, while the tegmina exterior to stripe are whitish hyaline, the costal plaques denser white; apical cells or a little more of apical parts of tegmina dusky. Face sometimes with a median dark vitta expanded into a triangular mark on lower side of vertex.

Length, 2.97 mm.; vertex LM 7, LE 3, WA 12.5, WP 19.5, OA 6, OP 12, OH 16; pronotum L 12, W 21; tegmen 13–62. Measurements from a female; Branchville, Maryland, April 2, 1915, on *Pinus virginiana,* (W. L. McAtee).

Other specimens examined are from Montgomery County, Maryland, and Mt. Vernon, Virginia, all from the same species of pine, (W. L. M.).

Erythroneura obliqua var. **stolata** new variety

Dorsal stripe continuous, not obviously made up of distinct vittae, entirely dusky to black, darkest anteriorly; in the type all other parts of dorsal surface are pale yellow, more or less overlaid by pruinosity, densest around margins of costal plaques; the pruinosity in dilute form extends even on the dorsal stripe; apical cells wholly dusky; other specimens are less pruinose and show some tendency toward a dark vitta on face.

Length, 2.87 mm.; vertex: LM 8, LE 3.5, WA 12, WP 19, OA 6, OP 10.5, OH 16; pronotum, L 11, W 20; tegmen 13–59.

Type—♀; Maywood, Alexandria County, Virginia, February 20, 1916, (W. L. McAtee), [W. L. M.]. *Paratypes*—(2.8 to 2.87 mm.), Mount Vernon, Virginia, March 21, 1915, L. O. Jackson; Beltsville, Maryland, Sept. 3, 1916, (W. L. McAtee), [W. L. M.].

Erythroneura obliqua var. **aucta** new variety

Dorsal stripe bright red along edges, fading to pale red or dusky within and more or less evanescent posterior of clavi; vittae the fusion of which

makes the stripe, paler on vertex, and narrowly separated there and on anterior margin of pronotum; color of dorsal surface except stripe pale greenish yellow; under-parts and legs pale yellow.

Length, 2.98 mm.; vertex: LM 6.5, LE 3.5, WA 12, WP 21, OA 6, OP 12, OH 14; pronotum: L. 11.5, W 21; tegmen 13–64.

Type and *paratype*—sex unknown; Folsom, California, 8–7, '85, [U. S. N. M.]. More and better material may prove this to be a distinct species.

Erythroneura obliqua var. **parma** new variety

Like variety *obliqua* except that scutellum is entirely red, marked with an incomplete and interrupted median pale vitta and with two nearly triangular black spots within the basal angles; costal plaques creamy yellow; face yellowish above, pinkish below: genitalia reddish laterally.

Length, 3.04 mm.; vertex: LM 6.5, LE 3.5, WA 12, WP 19, OA 6, OP 11, OH 21; pronotum L 11.5, W 21: tegmen 14–61.

Type—♂; Onaga, Kansas, (F. F. Crevecoeur), [U. S. N. M.].

Erythroneura obliqua var. **noevus** Gillette

Typhlocyba obliqua var. *noevus*. Gillette, C. P. Am. Typhlocybinae, 1898, pp. 757 to 758. [Onaga, Kansas.]

The original description states that this "variety has the typical red lining, but the scutellum and hind margin of the pronotum are more or less black" (p. 757). In view of this statement the selection of the type (type no. 3444, U. S. N. M.) was unfortunate in that it is an individual having the color vittae of scutellum and anterior dorsal surface, yellow. However, the inner tegminal vitta is reddish, so that it is possible to class the type with the red form of the variety as Gillette no doubt intended.

The scutellum of this variety may have a more or less obvious median pale area or vitta; the outer tegminal vittae may be more or less yellowish and the undersurface is pale yellow with greenish yellow to reddish markings.

Length, 2.77 mm.; vertex: LM 6.5, LE 3, WA 11, WP 19, OA 6, OP 10, OH 15; pronotum: L 11, W 21; tegmen 11–62.

Other specimens (2.8 to 2.97 mm.) were collected at Plummer's Island, Maryland; Oxford, Indiana and Manhattan, Kansas, [W. L. M., U. S. N.M.].

Erythroneura obliqua var. **noevus** Gillette, yellow form

Like the preceding but color markings yellow; in other words it is the *noevus* form of *E. obliqua* variety *obliqua*, yellow form.

Length, 2.87 mm.; vertex: LM 7, LE 3.5, WA 12, WP 19; OA 6, OP 11, OH 15; pronotum L 11, W 21; tegmen 13–58. Measurements from a female;

Plummer's Island, Maryland, July 19, 1914, (W. L. McAtee). Another specimen (2.8 mm.), same data (W. L. M.).

Erythroneura obliqua var. **fumida** Gillette

Typhlocyba obliqua var. *fumida* Gillette, C. P. Am. Typhlocybinae, 1898, p. 758. [Onaga, Kansas.].

This and the following variety of *Erythroneura obliqua* owe their characteristic appearance to the chiefly dark dorsum of abdomen, and of underlying parts of scutellum and pronotum which show through the wings and superficial layers of anterior parts, giving the insects a more or less pronounced dusky appearance. Besides this transmitted darkening the exterior surface may have dark coloring of its own in addition to the usual color markings of the species.

In variety *fumida* the dark markings are chiefly in the form of three transverse bands, an underlying one influencing appearance of posterior part of pronotum and anterior part of tegmina, another at about middle of tegmina, and the third an actual fumose band across tegmina over cross-veins. Between these markings in the type specimen the tegmina are distinctly whitish; costal plaques opaque whitish; the red vittae are wide, the scutellum wholly red except for a central spot and the vittae on pronotum and vertex unusually heavy.

The under surface of the type specimen also is unusually heavily pigmented; the whole face except lower surface of vertex being red, pinkish laterally, the remaining lower surface slaty brown, with the edges of abdominal segments pale.

A paratype has all the details of color pattern less pronounced.

Length, 2.7 mm.; vertex: LM 6, LE 3, WA 11.5, WP 19; OA 5.5, OP 10; OH 15; pronotum, L 10, W 19; tegmen 14–57.

Type—♀; Onaga, Kansas; [No. 3445, U. S. N. M.] Paratype—same data.

A considerable number of specimens (2.9 to 3.03 mm.) of this variety, collected at Mount Vernon, Virginia; Branchville and Plummer's Island Maryland; Anacostia, District of Columbia, and at Oxford, Indiana, also, have been examined. The obscuration of dorsal surface varies, the anterior two bands often more or less fused; the color markings, also, vary in detail, the color vittae on scutellum and anterior parts sometimes varying strongly toward yellow.

Erythroneura obliqua var. **fumida** Gillette, yellow form

Like variety *fumida* Gillette, except that the color vittae of tegmina are golden yellow, and those of anterior parts yellow more or less overlaid by red; veins and margins of tegmina beautifully pencilled in red; costal plaques opaque whitish.

Length, 3.1 mm.; vertex: LM 6, LE 3, WA 12, WP 20; OA 7, OP 14, OH 16; pronotum L 12, W 21.5; tegmen 14–65. Measurements from a female; Maywood, Alexandria County, Virginia, Jan. 2, 1916, (W. L. McAtee).

Other specimens were collected near Benning, District of Columbia, and Branchville, Maryland, all on *Pinus virginiana*, (W. L. McAtee), [W. L. M.].

Erythroneura obliqua var. **electa** new variety

The vittae on head and pronotum of this variety lack the usual high colors and vary from dull greenish yellow to slaty; the tegminal vittae are about typical in form, but are duller red than in variety *obliqua*, and are somewhat obscured by the general duskiness of tegmina, to which however the following areas are exceptions: whitish costal plaques (when developed), two long, triangular areas on inner margin of clavus; and separated very sharply, the clear third and fourth apical cells. General color of body slaty, margins of abdominal segments pale greenish yellow.

Length, 2.54 mm.; vertex: LM 7, LE 3, WA 10, WP 15.5; OA 4.5, OP 8, OH 13; pronotum L 9, W 12; tegmen 11–50.

Type—♀; Maywood, Alexandria County, Virginia, March 12, 1916, (W. L. McAtee), [W. L. M.]. Allotype—♂; same locality, February 20, 1916, (W. L. McAtee), [W. L. M.].

This form differing from all the varieties of *Erythroneura obliqua* in having two of the apical cells hyaline, and sharply marked off from the remainder of tegmen, may be a distinct species.

Erythroneura rubroscuta Gillette

Typhlocyba rubroscuta Gillette, C. P. Am. Typhlocybinae, 1898, p. 755. [Onaga, Kansas.].

Ground color of head and thorax pale yellow, of tegmina whitish hyaline; with the following pinkish red markings: scutellum (paler medianly), an oblique narrow band on each tegmen across apical third of clavus and running to or nearly to costal plaque, lines on some of the veins especially the crossveins and on base of costa, flecks on pronotum and head, in the form of inverted V-shaped marking, the rami of which are broad on (about one-third the width of) pronotum uniting to solidly occupy all of pronotum except a small semicircle on anterior margin; face sometimes with pinkish-red markings tending to be transverse; costal plaques whitish to yellowish.

Length, 3.2 mm.; vertex: LM 7.5, LE 3.5, WA 14.5, WP 22, OA 6.5, OP 13, OH 18; pronotum L 12, W 23; tegmina 14–70.

Type—♀; Onaga, Kansas (Kans. 2047), February, (F. F. Crevecoeur), [Type no. 3413 U. S. N. M.]. *Paratype*— same data,

and another female specimen same locality, same collector, [U. S. N. M.].

The species has been recorded also from Illinois.

Erythroreura crevecoeuri Gillette

Typhlocyba crevecoeuri, Gillette, C. P. Am. Typhlocybinae, 1898, pp. 767 to 768. [Onaga, Kanasa.]

Ground color of scutellum and anterior parts pale yellow, of tegmina whitish hyaline. Head and pronotum with an orange-reddish, inverted V-shaped marking; the rami of which are rather narrow and almost parallel on pronotum; scutellum reddish, basal triangles paler; tegmina with a large saddle marking extending nearly to cross-veins, broad margins of which are pinkish-red, the interior dusky; cross-veins and immediately adjoining parts of longitudinal veins orange-red, costal plaques denser white than remainder of tegmina, but obscured by pinkish-red. Below pale yellow, face and pleurae marked with red or reddish.

Length, 3.03 mm.; vertex LM 7, LE 3.5, WA 14, WP 21, OA 6, OP 12, OH 18; pronotum: L 11, W 22.5; tegmen 14-64.

Type—♀; Onaga, Kansas (Kans. 2047), early spring, (F. F. Crevecoeur) [Type no. 3455, U. S. N. M.]. *Paratypes*—♀; same data; and ♀, same locality and collector, [U. S. N. M.].

The species has been recorded, also, from New York, North Carolina and Ohio.

Erythroneura bipunctata Gillette

Typhlocyba bipunctata. Gillette, C. P. Am. Typhlocybinae, 1898, p. 751. [Tucson, Arizona.]

A strongly marked species, with the vertex of almost uniform length at all points (fig. 1); the fourth apical cell wide and angulate at base, and the vertex and scutellum each with two distinct dark dots.

Key to the Color Forms

Color markings of upper surface cherry red . . . . . red form, p. 283.
Color markings of upper surface smoky brown . . . . . dark form, p. 284.
Color markings of upper surface greenish yellow . . . . . yellow form, p. 284.

Erythroneura bipunctata Gillette, red form

Ground color of head, pronotum and scutellum ivory; vertex with three red vittae confluent along hind margin, and enclosing anteriorly two pale areas each with a round black spot; each eye with a similar spot on the posterior part; pronotum with irregular antero-lateral vittae cherry red and median and posterior parts of a more suffused red; scutellum with two spots of ground color flanked exteriorly by triangular black spots, a squarish median vitta anteriorly and remaining parts red, paler near apex; tegmen with basal

half of first sector, claval suture, first apical cell, fourth cross-vein and inner half of clavus, whitish hyaline; apical cells two, three and four, and distal half of areas between sectors one and two, and two and three, smoky; remainder cherry red; costal plaques inconspicuous. Legs and ground color of other lower parts (except underside of vertex) brownish ivory; face: lower side of vertex cherry red except for two round spots above bases of antennae, two convergent vittae from upper angles of front and two small lunes above them of ground color (ivory); front prominent with about seven pairs of red-brown vittae along sides flanking a median area of ground color wider below; clypeus black; cheeks with two to three flecks of red.

Length, 2.3 mm.; vertex: LM 4.5, LE 4, WA 11, WP 18; OA, 7, OP 10, OH 14; pronotum: L 11, W 19; tegmen 13–46.

Described from the type specimen. ♀; Tucson, Arizona, April 4, (R. E. Kunze), [No. 3441, U. S. N. M.].

Erythroneura bipunctata Gillette, dark form

This is the form mentioned by Gillette, (loc. cit.) in the following quotation: "I have received an additional female from Dr. Kunze taken at the same place April 30. It differs from the type in being nearly a half millimeter longer and having smoky brown coloration in place of the red."

Erythroneura bipunctata Gillette, yellow form

Like the red form except that ground color is pale yellow and the markings greenish-yellow. This small contrast sometimes results in various parts of the insect appearing almost unicolorous; the legs are stramineous. Costal plaques opaque whitish, inconspicuous in the more deeply colored specimens.

Length, 2.5 mm.; vertex: LM 4, LE 3, WA 11, WP 19; OA 5.5, OP 11, OH 14; pronotum: L 11, W 20; tegmen 13–51. (Measurements from a male, Victoria, Texas, Oct. 14, 1905, on huisache (*Vachellia farnesiana*), (J. D. Mitchell), [U. S. N. M.].

Numerous other specimens (2.3 to 2.6 mm.;) from same locality, July 29, 1903, and August 16, 1915, (J. D. Mitchell), [U. S. N. M.].

Erythroneura ador McAtee

Erythroneura ador. McAtee, W. L. Notes on Nova Scotian Eupterygid Leaf-hoppers, including descriptions of two new species. Can. Ent. xxix, No. 9, Nov. 1918, p. 361. [Halifax, Nova Scotia.]

An unusually large species for the genus, with long but blunt vertex (fig. 2) and long, and wide fourth apical cell, angulate at base. Color pale yellow, tegmina varying thru greenish to golden yellow, paler apically; costal plaques somewhat denser yellow; eyes brownish yellow; clavus dark.

Length, 3.8–4.5 mm.; vertex: LM 7.5, LE 4.5, WA 18, WP 22; OA 7, OP 11, OH 19; pronotum: L 14, W 25; tegmen 15–86.

Type—♀; Halifax, Nova Scotia, August 5, 1917, on elm, [N. S. Dept. Agriculture.

Paratypes—Same data, also, same locality, Sept. 1, 1917, [N. S. Dept. Agriculture; W. L. M.].

Erythroneura dentata Gillette

Typhlocyba dentata, Gillette, C. P. Am. Typhlocybinae, 1898, pp. 765 to 766, figs. 130 to 131. [Folsom, California.]

Ground color stramineous, markings pale yellow to orange yellow, as follows: two pairs of flecks on vertex the posterior larger, a pair of large roundish spots on disc of pronotum, angles of scutellum, a wide vitta on clavus, another on corium, and parts of radial margin of tegmen; costal plaques not evident. Underside and legs of ground color, almost unicolorous, claws dark

The last ventral segment of the female is more produced than usual in the genus and more or less notched in all the specimens so far examined; in one of the two specimens available for the present study, the notch is merely a shallow emargination, in the other it consists of two divergent slits bordering a central tongue or tooth which reaches almost to the posterior edge of the segment. The value of such notches for taxonomic purposes is questionable; it has been suggested more than once that they are made during copulation, a view which is supported by their variability.

Length, 3.36 mm.; vertex: LM 8, LE 5.5, WA 9, WP 25; OA 8, OP 14, OH 20; pronotum L 13, W 26; tegmen 17-70.

Type and *paratype*—(3.46 mm.), both females, Folsom, California, August 7, 1885, [Type no. 3453, U. S. N. M.].

Erythroneura abolla new species

A species with a wide, fourth apical cell, distinctly angulate at base, and with a comparatively blunt vertex (fig. 3), easily distinguished from the three other species in its group by the characters given in the key. The present species has a number of color varieties, two of which resemble in appearance parallel varieties of *E. obliqua*. However the blunter vertex and angulate, not smoothly curved, base of fourth apical cell identifies them with *E. abolla*.

With little doubt a variety of this species is the form Gillette speaks of in connection with *E. obliqua*, as having been found among Hart's Illinois material, "having the red coloration almost evenly diffused over the vertex, pronotum, scutellum and anterior two-thirds of the elytra."[6] I have seen the species in the

[6]Gillette, C. P., Am. Typhlocybinae, 1898, p. 758.

Hart collection, and apparently about the same range of color varieties is present in Illinois as in the vicinity of Washington, D. C.

Key to the Color Varieties

A. Tegmina dusky hyaline, or of about uniform color to cross-veins.
  B. Colors more or less contrasted anterior and posterior to cross-veins.
    C. Tegmina anterior to cross-veins, solid bright to dusky red.
      D. Vertex and pronotum chiefly red.
        var. **accensa** new variety, p. 288.
      DD. Vertex and pronotum chiefly yellow.
        var. **accensa** new variety, yellow form, p. 288.
    CC. Tegminal coloration otherwise.
      D. Tegmina to cross-veins diffuse pinkish red to dusky.
        var. **abolla** new variety, p. 286.
      DD. Tegmina to cross-veins yellowish hyaline.
        var. **abolla** new variety, yellow form, p. 286.
  BB. Color of entire tegmina about uniform dusky hyaline.
    var. **iconica** new variety, p. 287.
AA. Tegmina with more or less distinct longitudinal color vittae.
  B. Vittae reddish..... var. **varia** new variety, p. 287.
  BB. Vittae yellowish.... var. **varia** new variety, yellow form, p. 287.

Erythroneura abolla var. **abolla** new variety

Because most abundant this is considered the typical variety; its type, therefore, is the type of the species.

The general color varies from diffuse pinkish-red to dusky-hyaline with a pinkish cast, the color extending to or nearly to cross-veins, beyond which the tegmina are hyaline more or less clouded with whitish to dusky; costal plaques whitish opaque. The scutellum and anterior parts in some cases are yellowish, and the red color on tegmina may be almost entirely restricted to the veins, along which it tends to form streaks. Face varying from yellowish to pinkish red, sometimes with median vitta and underside of vertex paler; legs pale, they and pleura more or less tinged with same color as face; body slaty with margins and incisures of abdominal segments, and genitalia chiefly paler.

Length, 2.83 mm.; vertex: LM 5.5, LE 3, WA 12, WP 20, OA 6, OP 12, OH 17; pronotum: L 12, W 22; tegmen 13–60.

Type—♀; Mount Vernon, Virginia, February 28, 1915, (L. O. Jackson), [W. L. M.].

Other specimens (2.73 to 3.13 mm.) examined were from same locality as the type (W. L. McAtee); Branchville, Maryland, and Maywood Virginia, (W. L. McAtee), all on *Pinus virginiana*, [W. L. M.].

Erythroneura abolla var. **abolla,** yellow form

Upper surface pale yellow, except dark eyes, tegmina yellowish hyaline, apical cells and small clouds between sectors anterior to cross-veins dusky.

Undersurface, except mesosternum, and legs pale yellowish, dorsum of abdomen chiefly slaty.

Length, 3.23 mm.; vertex: LM 6.5, LE 3.5, WA 14, WP 21, OA 7, OP 12, OH 19, pronotum: L 13, W 24; tegmen 15–66. Measurements from a female; Forest Glen, Maryland, July 24, 1916, (Otto Heidemann), [U. S. N. M.], the only specimen seen.

Erythroneura abolla var. **iconica** new variety

In this variety are ranged the specimens of *E. abolla* in which the tegmina are about uniformly colored throughout, without contrast anterior and posterior of region of cross-veins as in the preceding varieties. In the specimens examined this color is dusky hyaline, varying in depth, and more or less modified by pruinosity or tinge of red. Scutellum and anterior parts chiefly sordid yellowish; face of same color more or less tinged with reddish; legs and body as in preceding varieties.

Length, 3.23 mm.; vertex: LM 7, LE 4, WA 14, WP 22.5, OA 8, OP 14, OH 18; pronotum: L 13, W 25; tegmen 15–65.

Type—♀; Mount Vernon, Virginia, Feb. 28, 1915, (W. L. McAtee), [W. L. M.]. *Allotype*—♂; (2.73 mm.), same data. *Paratype*—(2.93 mm.) ♀; Corner Conduit and Potomac Roads, Montgomery County, Maryland, on *Pinus virginiana*, March 28, 1915, (W. L. McAtee), [W. L. M.].

Erythroneura abolla var. **varia** new variety

Ground color dull yellowish, with reddish markings as follows: more or less distinct inverted U-shaped mark on head, two nearly parallel short vittae on disk of pronotum, apex of scutellum, most of clavus, and vittae along third sector and costa, the latter interrupted by the opaque whitish costal plaque; other veins also red in some specimens. Face and legs tinged or marked with yellowish to red, and sometimes dusky; body slaty, incisures and margins of segments pale yellow.

Length, 2.73 mm.; vertex: LM 5, LE 3.5, WA 11, WP 19, OA 6, OP 11.5, OH 15; pronotum: L 10, W 20; tegmen 12–55.

Type—♂; Mount Vernon, Virginia, Feb. 28, 1915, (W. L. McAtee), [W. L. M.]. *Paratypes*—(2.6 to 2.9 mm.), males, Plummer's Island, Maryland, January 11, 1914, and Corner of Conduit and Potomac Roads, Montgomery County, Maryland, on *Pinus virginiana*, March 14, 1915, (W. L. McAtee), [W. L. M.].

Erythroneura abolla var. **varia,** yellow form

General color above dull greenish yellow, relieved by the following somewhat brighter yellow markings: anterior border, and fleck on posterior border of pronotum, basal angles of scutellum and vitta on clavus, and along third sector of tegmen; costal border of tegmen also brighter yellowish; tegmina

from just before apical cells dusky; face and body dull greenish yellow, legs stramineous.

Length, 2.76 mm.; vertex: LM 5, LE 3, WA 13, WP 18, OA 7, OP 10.5, OH 14; pronotum: L 10.5, W 20; tegmen 12–55. Measurements from a female; Plummer's Island, Maryland, Oct. 4, 1914, (W. L. McAtee), [W. L. M.], the only specimen seen.

Erythroneura abolla var. **accensa** new variety

Upper surface anterior to cross-veins cherry to dusky red, relieved by yellowish edgings on vertex (paler medianly here also) and pronotum; posterior third of tegmina whitish hyaline, costal plaques opaque whitish, leaving, when scaled off, an area dusky hyaline rather than color of remainder of tegmina. Face pale to bright reddish, sometimes with a pale yellow median vitta, and with two oval yellow areas between eyes; legs pale yellow more or less tinted with red; body dark, edges and incisures of abdomen pale yellow; genitalia pale, marked with red or darker.

Length, 2.83 mm.; vertex: L 6, LE 4, WA 12, WP 20, OA 6, OP 11, OH 16; pronotum: L 11, W 21; tegmen 13–58.

Type—♀; Maywood, Virginia, on *Pinus virginiana*, Feb. 20, 1916,(W. L. McAtee), [W. L. M.]. *Allotype*—♂ (2.77 mm.); Mount Vernon, Virginia, Feb. 28, 1915, (W. L. McAtee), [W. L. M.].

Erythroneura abolla var. **accensa** yellow form

Like the preceding except that the vertex and anterior parts of pronotum are pale yellow, shading to the general color or to dusky on posterior parts of pronotum and on scutellum; costal plaques obscured by general color of tegmina; face yellow, paler between eyes; legs pale yellow; body dark, edges and incisures of abdomen pale yellow; genitalia pale yellow, strikingly contrasted to body color.

Length, 2.73 mm.; vertex: L 6, LE 4, WA 13, WP 20, OA 6, OP 12, OH 17; pronotum: L 11, W 21; tegmen 12–56. Measurements from a female; Odenton, Maryland, on hickory, August 14, 1918, W. L. McAtee (W. L. M.). One other specimen examined, a female, Anacostia, District of Columbia, July 22, 1913, (W. D. Appel), [W. L. M.].

Erythroneura tecta new species

A very distinctly marked species, larger than most of the genus, with bluntly rounded vertex (fig. 6), swollen face, pronotum decidedly arcuate posteriorly, clavus distinctly roof-shaped, the part within claval (second anal) vein lying horizontally, when tegmina are closed, and that without sloping sharply; fourth apical cell angulate (fig. 9); ventral plate of female arcuate laterally, much produced medianly, this process more or less split longitudinally.

Key to the Color Varieties

A. Averaging larger (2.9 to 3.46 mm.); pronotum and scutellum chiefly yellow; tegmina usually with considerable red markings.
var. **tecta** new variety, p. 289.

AA. Averaging smaller (2.64 to 2.97 mm.); pronotum and scutellum chiefly dusky; tegmina with few or no red markings.
var. **carbonata** new variety, p. 289.

Erythroneura tecta var. **tecta** new variety

Ground color of scutellum and anterior parts pale yellow; vertex with two round dusky spots on disc which are more or less connected with each other, with inner side of orbits, and with posterior margin by arcuate reddish markings; pronotum with an angulate brown vitta sometimes broken up into dusky spots on each side, and two discal spots sometimes concealed by reddish markings, which when fully developed form a U based on posterior margin; scutellum with basal triangles black, margins and apex reddish; tegmina whitish hyaline (dorsal pale areas more or less opaque); clavus is perhaps best described by saying it is red, sometimes brownish, except the whitish hyaline extreme base, a large more opaque whitish or pale yellow area near scutellum and entirely within claval (second anal) vein a smaller whitish area overlapping apex of last but entirely outside claval vein, and a small transverse whitish band just before apex; corium more or less bluish or dusky between veins, the veins often reddish; two whitish areas bounded by red between third sector and claval suture, costal plaque pale yellow, more or less overlaid by opaque white, bounded at both ends by dusky clouds, costa hyaline posteriorly, interrupted by red cross-vein; apical cells fumose with a darker area at base of fourth cell and another at apex of wing, common to second and third cells, often forming an oblique vitta. Face pale yellowish a dark spot on base of clypeus, two others above just within antennal bases, lower surface of vertex marked by a few reddish lines; legs pinkish livid; body slaty, or with pale yellowish edgings.

Length, 3.39 mm.; vertex: LM 8, LE 4, WA 18, WP 24.5, OA 8, OP 13, OH 20; pronotum: L 12, W 26; tegmen 17–69.

Type—♀; Maryland, near Plummer's Island, January 25, 1914, among mullen leaves, (W. L. McAtee), [W. L. M.]. *Paratypes*—(2.9 to 3.46 mm.), both sexes from same locality, March, June, and September, and from Plummer's Island, itself, January, March April, May, October and November, (W. L. McAtee), [W. L. M.].

Erythroneura tecta var. **carbonata** new variety

A smaller, dusky form, the scutellum and pronotum especially being much darker than in the typical variety, the tegmina with much less red, the tip of clavus and margin of pale spot near base of clavus, however, sometimes red.

Length, 2.8 mm.; vertex: LM 6.5, LE 3.5, WA 14, WP 21, OA 7, OP 12, OH 16; pronotum: L 11, W 21; tegmen 14–56.

Type—♂; Plummer's Island, Maryland, Dec. 14, 1913, (W. L. McAtee), [W. L. M.]. *Paratypes*—(2.64 to 2.97 mm.), both sexes, from same locality, October, November, and from Maryland near Plummer's Island, July, August and September

Erythroneura aclys new species

Base of fourth apical cell angulate, vertex rather pointed; color pattern consisting of a broad brown to black stripe extending whole length of insect, margined by pale yellow. The dorsal stripe nearly black on scutellum and anterior parts sharply cut off from a pale yellow margin about the width of eye; on tegmina the stripe is smoky brown, greatly expanded and irregularly set off from the pale yellow costal margin, percurrent to second apical cell which is about the width of costal plaque; the latter has a slight opaque whitish coating, is margined interiorly and anteriorly by reddish, and underlaid posteriorly by blackish; there are touches of red upon apex of clavus and first crossvein and more or less hyaline spots at extremities of apical third of clavus, on the corium nearby and in middle of fourth apical cell. The legs, pleura and face vary from flesh-color to pale yellow, and the venter is pale yellow with a median series of slaty spots, the posterior ones extending entirely across last abdominal segment and across base of genitalia; dorsum slaty.

Length, 2.64 mm.; vertex: LM 7, LE 3, WA 11, WP 17.5, OA 5, OP 10, OH 16; pronotum: L 11, W 20; tegmen 13–55.

Type—♂; Plummer's Island, Maryland, December 21, 1913, (W. L. McAtee), [W. L. M.].

Erythroneura illinoiensis Gillette

Typhlocyba illinoiensis. Gillette, C. P. Am. Typhlocybinae, 1898, pp. 758 to 759. [Illinois, Mississippi, Michigan.]

This species is recognizable by the narrow fourth apical cell, distinctly angulate at base (fig. 10), and the color pattern of chiefly discrete spots, three large round ones of which are on the median line of vertex, pronotum and scutellum, and a large black one on corium is usually ocellate with yellow or red. The latter spot, not ocellate, is the best mark for recognition of the pale variety of *illinoiensis*. The known range of the species extends from New York and Michigan to Kansas, Mississippi and North Carolina.

Key to the Color Varieties

A. Tegmina practically without color markings other than the three black dots on each ..... var. **spectra** new variety, p. 292.

AA. Tegmina with other markings.

B. Tegminal color markings chiefly red. . var. **illinoiensis** Gillette, p. 292.

BB. Tegminal color markings chiefly yellow.

var. **illinoiensis** Gillette, yellow form, p. 291.

Erythroneura illinoiensis var. **illinoiensis** Gillette

Since the red-spotted form of *illinoiensis* was evidently considered typical by Gillette (vide locicit.), the name *illinoiensis* as a varietal term is hereby restricted to that form.

General color pale yellow, the scutellum and parts anterior often being ivory color to livid, with flecks or streaks of pale yellow; vertex, pronotum and scutellum each with a large round spot of bright red, discal in the first two parts of body and apical on last; clavus with a spot near base and apex and a streak along inner side: corium with basal spot, streak along costa, on first cross-vein and on second and third sectors, the last three spots in a step-like series. the inner spot farthest cephalad, red; large black spot on corium ocellate with orange-red (in some specimens the colors appear as if they had "run" from the spots, giving a diffusely streaked appearance); apical cells yellowish fumose; underside pale yellow except face which sometimes is rather livid; legs stramineous except for dark claws.

Length, 2.8 mm.; vertex: LM 7, LE 4, WA 10, WP 17, OA 5, OP 8, OH 14; pronotum: L 10, W 19; tegmen 13–57. The supposed type specimen being in poor condition description and measurements are taken from a female specimen, collected at Plummer's Island, Maryland Dec. 14, 1913, (W. L. McAtee).

Gillette undoubtedly intended Illinois to be the type locality of the species he named for that state, although he does not specifically say so. The type is recorded simply as No. 3446 U. S. N. M. There is no specimen from Illinois in the National Collection, but there are four specimens bearing type number 3446. Three of these are from the lot without locality, but labelled "On Vogelleim grape," mentioned by Gillette, but these belong to the two forms hereafter described. The remaining specimen bearing the type label is of the typical variety; it was collected at Agricultural College, Mississippi, Oct. 27, 1894, by H. E. Weed. It must therefore be regarded as the type of *illinoiensis*, unless an Illinois specimen with better credentials be discovered.

Other specimens (2.7 to 2.9 mm.) of the typical variety examined were collected at Washington and Anacostia, District of Columbia; Plummer's Island, and Beltsville, Maryland; Maywood, Virginia, and Oxford, Indiana.

Erythroneura illinoiensis var. **illinoiensis,** yellow form

Like the typical variety, except that the color markings on tegmina are chiefly or entirely yellow instead of red; sometimes the dots on scutellum, pronotum and vertex also are in part yellow.

Length, 2.8 mm.; vertex: LM 7.5, LE 3.5, WA 12, WP 18, OA 6, OP 9, OH 15, pronotum: L 11, W 18,5; tegmen 13–60. Measurements from a female; Riley, County, Kansas, July (Marlatt), [U. S. N. M.].

Paratypes, with same data, and from District of Columbia also without locality, but annotation "On Vogelleim Grape," Sept. 12, 1873 (part of original type material), [U. S. N. M.], and from Plummer's Island, Maryland and Maywood, Virginia, (W. L. M.).

Erythroneura illinoiensis var. **spectra** new variety

Red or yellow coloration nearly or entirely lacking, the body being pale yellow and the wings and tegmina hyaline, the latter with the characteristic black spots.

Length, 2.8 mm.; vertex: LM 6, LE 3, WA 11, WP 17, OA 5, OP 9, OH 14; pronotum: L 9, W 17; tegmen 12–59.

Type—♂; Anacostia, District of Columbia, April 30, 1913, (W. D. Appel), [W. L. M.]. *Paratypes*—Plummer's Island, Maryland and Scott's Run to Balls Hill, Virginia (W. L. M.) and without locality, but annotation "On Vogelleim Grape," Sept. 12, 1873, [U. S. N. M.]

Erythroneura morgani De Long

Typhlocyba morgani, De Long, D. W. Jassoidea of Tennessee., Bull. 17, Tenn. State Bd. Ent., June, 1916, p. 104. [Clarksville, Tenn.].

Ground color of scutellum and anterior parts pale yellow, of tegmina whitish hyaline. In five specimens examined the eyes are of three different colors, greenish, livid and black; vertex with an anterior series of three spots, varying from translucent ground color to red, and a posterior series of four, the outer ones of the latter series connected with the inner pair and the latter to hind margin of vertex; pronotum with an anterior series and a discal pair of spots more translucent than ground color, posterior half of pronotum occupied by a brown to black band the forward edge of which is deeply emarginate medianly, and extended in a pair of curved finger-like markings behind eyes; scutellum with two brown to black spots within basal triangles and sometimes a smaller one in middle of base; tegmina with the following yellow to red markings: three on clavus of which the upper two may be united, two dots on corium of which one is basal, and one on front edge of costal plaque, a streak along third sector, and sometimes the first cross-vein and adjacent costal margin; a broad brown band in front of cross-veins, darkest, sometimes black, at base of fourth apical cell and at posterior edge of costal plaque. Underside straminous to ivory color.

Length, 2.97 mm.; vertex: LM 6, LE 4, WA 13, WP 21, OA 6, OP 13, OH 18; pronotum: L 12, W 22; tegmen 15–61. Measurements from a female from Plummer's Island, Maryland, (W. L. McAtee).

Key to the Color Varieties.

A. Tegminal spots yellow..... var. **morgani** De Long, p. 292.
AA. Tegminal spots red..... var. **morgani** De Long, red form, p. 292.

Mr. De Long has kindly sent me for examination, two specimens from the type collection, obtained by him on sycamore, at Clarksville, Tennessee, July 22, 1915. There is a similar yellow-spotted specimen in the National Collection, labelled Glen Echo, Maryland, 10.5. The species has been recorded also from Ohio. The red-spotted form I have collected, at Plummer's Island, Maryland, October 26 and December 14, 1913.

Erythroneura hartii Gillette

Typhlocyba harti. Gillette, C. P. Am. Typhlocybinae, 1898, p. 754. [Illinois.]

Ground color of scutellum and anterior parts ivory-white to pale yellow, of tegmina whitish hyaline to ivory-white; three spots on transition from vertex to front, and four on vertex between eyes, of which the central pair may be connected with lateral spots and with posterior margin of vertex, translucent to red; pronotum with a series of three large spots across middle and four small ones near anterior margin, sometimes connected into simple lateral and U-shaped median vittae, translucent to red; scutellum with basal triangles and sometimes apex similarly colored; tegmen bright red to crossveins, a narrow irregular costal margin, and a nearly semi-circular spot in middle of clavus and adjacent corium of ground color (whitish hyaline to ivory-white), apical cells yellow fumose, costal plaque (when developed) chalky white, a dark spot at posterior edge of costal plaque and another within base of fourth apical cell. Face more or less marked with yellowish to red or plain stramineous to livid; legs and venter stramineous to pale yellow.

Length, 2.64 mm.; vertex: LM 6.5, LE 3.5, WA 11, WP 17.5, OA 6.5, OP 10.5, OH 15; pronotum: L 10.5, W 20; tegmen 13–53. Measurements taken from a specimen, sex unknown, abdomen missing, collected on Plummer's Island, Maryland, Dec. 14, 1913, (W. L. McAtee), [W. L. M.].

Other specimens examined are from the same locality and from Washington, District of Columbia; Mount Vernon and Vienna, Virginia, and Oxford, Indiana (W. L. M.). The species has been recorded also from Pennsylvania.

Erythroneura scutelleris Gillette

Typhlocyba comes var. *scutelleris*. Gillette, C. P. Am. Typhlocybinae, 1898, p. 764. [Type No. 3449, U. S. N. M., which is labelled "Kans. 2047."]

Because most of the specimens I have examined have the fourth apical cell distinctly angulate instead of merely oblique, and because I have seen no intergrades in the matter of scutellar coloration, I am separating *scutelleris* as a species distinct from *E. maculata*, to which it is similar in general coloration. The typical variety has the color markings red; there is also a yellow-spotted form. The known range of *E. scutelleris* extends from Maryland and Virginia to Ohio, Tennessee and Kansas.

Erythroneura scutelleris Gillette, red form

Bibliographical reference same as for the species.

Vertex pale yellow with a red marking connecting two discal spots with front and hind margins and inner borders of eyes, or traces of such markings; pronotum pale yellow anteriorly with obscure reddish markings; scutellum and posterior half, sometimes all, of pronotum and parts of head smoky to black; tegmina whitish to yellowish hyaline, marked with irregular red spots, of which three are on clavus (the upper two tending to fuse), and those on corium tend to be arranged in two oblique series; a ramose red line on cross-veins.

Length, 2.73 mm.; vertex: LM 5.5, LE 3, WA 10.5, WP 17.5, OA 4.5, OP 10, OH 14; pronotum: L 10, W 19; tegmen 12–59.

Other specimens than the type examined (2.3 to 2.77 mm.) were collected at Plummer's Island, Maryland, and Maywood, Alexandria County, Virginia, (W. L. McAtee), [W. L. M.].

Erythroneura scutelleris Gillette, yellow form

Like the preceding except that the color markings are orange-yellow.

Length, 2.77 mm.; vertex: LM 6, LE 3, WA 10.5, WP 18, OA 5, OP 9.5, OH 14; pronotum: L 9, W 19; tegmina 14–59. Measurements from a male, collected two miles west of St. Louis, Missouri, April 25, 1904, (W. V. Warner) [U. S. N. M.], the only specimen seen.

Erythroneura basilaris Say

T.[ettigonia] basilaris. Say, Thomas. Desc. new Hem. Ins., Journ. Ac. Nat. Sci. Phila. IV, 1825, p. 345. Compl. Writings, II, 1859, p. 260. [Missouri.].

Typhlocyba comes variety *basilaris*. Gillette, C. P. Am. Typhlocybinae, 1898, p. 760.

I have discovered no intergrades between *basilaris* and other forms of *Erythroneura*, so treat it as a species. It differs structurally from *E. comes* Say in having the inner (fourth) cross-vein

distinctly oblique. The known range of the species extends from New York and Wisconsin to Virginia, Tennessee and Kansas.

Key to the Color Varieties

A. Color markings, in part, red to sanguineous.
  B. Basal tegminal band sanguineous to dusky.
    C. Other markings chiefly red..... var. **basilaris** Say, p. 295.
    CC. Other markings chiefly yellow.
      var. **basilaris** Say, yellow form, p. 295.
  BB. Basal tegminal band pinkish, other markings chiefly yellow.
    var. **dulcis** new variety, p. 296.
AA. All color markings yellow..... var. **affinis** Fitch, p. 296.

Erythroneura basilaris var. **basilaris** Say

Ground color of body pale yellow, of tegmina whitish hyaline. Vertex marked with reddish to livid, often leaving only two pairs of small spots near eyes and a larger median one of ground color exposed; pronotum slaty behind, a triangular red patch on each side and a U-shaped marking in middle more or less connected with four smaller reddish markings along anterior margin; scutellum, either partly or entirely sanguineous to dusky; basal third (about to middle of but not involving costal plaque) of tegmen of same color, relieved by more translucent spots near humerus, inner apical angle, and an irregular transverse one on corium midway between costal plaque and humeral spot; paler red markings on tegmen as follows: spot near tip of clavus, near this on corium, an inverted V-shaped marking with inner ramus much longer (sometimes broken up into spots), first and second cross-veins and faint-costal edging; apical cells yellowish fumose caudally, a black spot at base of the fourth cell. Face and legs more or less tinged with yellowish to reddish.

Length, 1.83 mm.; vertex: LM 6, LE 4, WA 13, WP 19.5, OA 7, OP 11.5, OH 16; pronotum L 11, W 21; tegmen 13–58. Measurements taken from a male, collected at Plummer's Island, Maryland, Dec. 14, 1913, (W. L. McAtee).

Other specimens examined came from Plummer's Island, Maryland; Maywood, Virginia; Oxford, Indiana; Iowa City, Iowa; Manhattan and Onaga, Kansas, and Clarksville, Tennessee.

Erythroneura basilaris var. **basilaris** Say, yellow form

Like the preceding except that the red markings on head, pronotum, and tegmina are replaced by pale yellow; markings on head and anterior part of pronotum sometimes livid.

Length, 2.7 mm.; vertex: LM 5, LE 3, WA 12, WP 19, OA 5.5, OP 11, OH 16; pronotum: L 9.5, W 20; tegmen 14–56. Measurements from a female; Plummer's Island, Maryland, July 19, 1914, (W. L. McAtee). [W. L. M.].

Other specimens seen were from the same locality as the measured specimens, March 14, 1915, (W. L. M.); Piney Branch, District of Columbia Sept. 12, 1914, (W. L. M.); Iowa City, Iowa, (L. L. Buchanan), [W. L. M.]; Forest Glen, Maryland, July 24, 1916, Aug, 10, (Otto Heidemann); two specimens without data, [U. S. N. M.].

Erythroneura basilaris var. **dulcis** new variety

Tegminal band pinkish, tegminal spots yellow, markings on scutellum and anterior parts translucent to livid.

Length, 2.64 mm.; vertex: LM 6, LE 3, WA 11, WP 18, OA 5.5, OP 10, OH 14.5; pronotum: L 9.5, W 19; tegmen 13–55.

Type—♀; Plummer's Island, Maryland, March 18, 1917, (W. L. McAtee), [W. L. M.].

Erythroneura basilaris var. **affinis** Fitch

E. [*rythroneura*] *affinis*. Fitch, Asa. Cat. State Cabinet, N. Y., 1851, p. 63. Lintner, Reprint, 1893, p. 403. [New York.]

Tegminal band yellowish brown, other color markings yellow, those on anterior part of pronotum and on vertex sometimes obsolete.

Length, 2.77 mm.; vertex: LM 7, LE 3.5, WA 12.5, WP 20, OA 6, OP 10, OH 20; pronotum: L 10, W 20; tegmen 13–57. Measurements from a female, one of three specimens, from Manhattan, Kansas, April 26, 1877, on wild gooseberry, A. N. Godfrey, [U. S. N. M.].

Erythroneura maculata Gillette

Typhlocyba comes var. *maculata*. Gillette, C. P. Am Typhlocybinae, 1898, p. 764. [Type No. 3448, U. S. N. M., which was collected at Onaga, Kansas.].

This species, which in numerous specimens may agree almost exactly in color with examples of *E. comes* Say, is distinguished by the greater obliquity of the fourth cross-vein (fig. 11) and lack of a black dot or cloud in apex of second apical cell. Occasional puzzling individuals may be found, but in general the distinction is clear and the species easily recognized. The known range extends from Maryland and Wisconsin to Virginia, Georgia, Texas and Kansas.

Specimens of *maculata* occur with the color markings paler anteriorly, with part of the markings yellow and part red, and sometimes even with one tegmen red-marked, the other yellow. It has not, therefore, seemed advisable to recognize such variants by name. A form in this category, however, has been named,

viz. *T. comes* var *apicalis* De Long[8]. It has the markings on clavus and on corium anterior to costal plaque sulphur yellow, and from costal plaque to cross-veins and sometimes streaks on apical veins orange-red; scutellum and parts anterior pale yellow, with translucent to sulphur-yellow markings. Through the kindness of Mr. De Long I have examined two specimens from the type lot collected by him at Covington, Tennessee, June 18, 1915; the form pertains to *maculata* rather than *comes*.

Key to the Color Varieties

A. Color markings present.
  B. Clavus with a conspicuous red patch or band sometimes extending over adjacent parts of corium.
    C. Anterior two-thirds of clavus red.
      D. No more than a trace of red on corium adjacent to claval marking.
        E. Subsidiary tegminal markings red.
          var. **bella** new variety, p. 300.
        EE. Subsidiary tegminal markings yellow.
          var. **bella** new variety, yellow form, p. 300.
      DD. A band of red across corium from claval marking.
        var. **osborni** De Long, p. 300.
    CC. Claval marking otherwise.
      D. Middle of clavus with a red band, which sometimes is extended more or less continuously across corium.
        E. Subsidiary tegminal markings red.
          var. **era** new variety, p. 299.
        EE. Subsidiary tegminal markings yellow.
          var. **era** new variety, yellow form, p. 300
      DD. Posterior third of clavus occupied by a red spot.
        var. **accola** new variety, p. 299.
  BB. Clavus not so marked.
    C. Vertex and pronotum chiefly red. . var. **ardens** new variety, p. 299.
    CC. Vertex and pronotum with only the usual color markings.
      D. Tegminal markings red to sanguineous
        var. **maculata** Gillette, p. 298.
      DD. Tegminal markings orange to greenish yellow.
        var. **maculata** Gillette, yellow form, p. 298.
AA. Color markings nearly or entirely lacking.
  B. With a dark spot in basal angle of fourth apical cell, and a smaller one just within posterior border of costal plaque.
    var. **bigemina** new variety, p. 300.
  BB. With only the former spot present.
    var. **gemina** new variety, p. 301.

[8] Leafhoppers of Tennessee, Bull. 17, Tenn. State Bd. Ent., 1916, pp. 108 to 109.

Erythroneura maculata var. **maculata** Gillette

Bibliographic reference same as for the species.

Description of Type.—Ground color of scutellum and anterior parts ivory, of tegmina yellowish hyaline: with the following scarlet markings; median vitta on vertex, discal and two lateral large spots, besides two faint ones near anterior margin, on pronotum, basal angles and apex of scutellum, three well-separated spots on clavus, a spot at base of corium, an oblique streak over front of costal plaque, spot between latter and clavus, three streaks along sectors just posterior to costal plaque, and a line on cross-veins extending slightly also on adjacent parts of sectors and apical veins; apical cells yellowish fumose, a dark dot in base of fourth. Undersurface and legs stramineous to yellowish.

Length, 2.64 mm.; vertex: LM 7, LE 3.5, WA 10.5, WP 16.5, OA 5.5, OP 9, OH 15: pronotum: L 9.5, W 13: tegmen 13–54. (Type, a male.)

There is considerable variation in the details of coloration of this form, some specimens having the markings more broken up into spots, but most of them showing a tendency for the markings to become larger and fuse, this being especially true of the spots on clavus, vertex and pronotum. Markings of the last two divisions of the body frequently approximate the normal type for leaf-hoppers of this group, namely three spots across rondure of vertex, four between eyes, the central pair large and often fusing with spots nearest them or extending to posterior margin of vertex; for the pronotum, four spots near anterior margin, the outer often forming lateral vittae, and a discal pair, frequently uniting with each other and with median pair of anterior spots. In highly colored specimens the face, pleura and legs may be more or less tinged or spotted with red. About half of the specimens have the upper two spots on clavus fused, this condition usually being accompanied by heavier coloring elsewhere.

Specimens (2.64 to 3.03 mm.) other than the type examined were collected at Plummer's Island, Hyattsville, Beltsville, and Laurel, Maryland; Washington, and Anacostia, District of Columbia; Dead Run, Fairfax County, and Maywood, Alexandria County, Virginia; Oxford, Indiana, and Iowa City, Iowa, [W. L. M.]; Washington, District of Columbia; Clarksville, Tennessee; St. Louis, Missouri, and Onaga, Kansas, [U. S. N. M.].

Erythroneura maculata var. **maculata** Gillette, yellow form

Like the preceding except that the color markings are of varying shades of (greenish to orange) yellow instead of red. This being a generally paler form the markings of scutellum and anterior parts often are merely translucent ground color.

Length, 3.03 mm.; vertex: LM 7, LE 4, WA 12.5, WP 20.5, OA 6.5, OP 10.5, OH 16; pronotum: L 12, W 22; tegmen 13–60. Measurements from a female; Washington, District of Columbia, June 15, 1913, (W. L. McAtee), [W. L. M.].

Other specimens (2.47 to 2.97 mm.) were collected at Plummer's Island, Odenton, Beltsville, and Forest Glen, Maryland; Washington, Binning and Anacostia, District of Columbia; Great Falls, Scotts Run, Dead Run, Falls Church and Mount Vernon, Virginia, and Oxford, Indiana, [W. L. M.]: Baltimore, and Glen Echo, Maryland, Washington, District of Columbia; Augusta, Georgia; Dallas and Tyler, Texas, and St, Louis, Missouri, [U. S. N. M.].

Erythroneura maculata var. **ardens** new variety

A highly colored form with vertex and pronotum chiefly red, tegminal markings heavier, the upper two on clavus fused, and face, pleura, legs and genitalia tinged with red. The posterior part of pronotum and the scutellum are duskier than usual, the latter with margin, and three vittae, the median interrupted, darker, and apex dark red.

Length, 2.64 mm.; vertex: LM 5.5, LE 3, WA 11, WP 17, OA 6, OP 9.5, OH 14; pronotum: L 10, W 18.5; tegmen 13–57.

Type—♂; Plummer's Island, Maryland, March 28, 1915, (W. L. McAtee), [W. L. M.].

Erythroneura maculata var. **accola** new variety

Like variety *maculata*, red form except that posterior third of clavus is occupied by a solid red patch of deeper red color than the other tegminal markings.

Length, 2.83 mm.; vertex: LM 5.5, LE 3.5, WA 10, WP 17.5, OA 6.5, OP 10.5, OH 15; pronotum: L 11, W 20; tegmen 13–60.

Type—♂; Plummer's Island, Maryland, Dec. 21, 1913, (W. L. McAtee), [W. L. M.].

Erythroneura maculata var. **era** new variety

Middle of clavus has a distinct red band, which is extended more or less continuously across corium to front of costal plaque; subsidiary tegminal markings red.

Length, 2.64 mm.; vertex: LM 6.5, LE 4, WA 10, WP 18, OA 5, OP 9, OH 15; pronotum: L 10, W 19; tegmen 12–53. (Measurements from a paratype.)

Type—♂; (2.9 mm.), Maywood, Alexandria County, Virginia, February 20, 1916, (W. L. McAtee), [W. L. M.]. *Paratypes* (2.64 to 2.9 mm.) from same locality, January 2, 1916, [W. L. M.].

Erythroneura maculata var. **era.** yellow form

Like the preceding except that the subsidiary markings are yellow.

Length, 2.77 mm.; vertex: LM 6.5, LE 3.5, WA 12, WP 19, OA 6, OP 11, OH 15; pronotum: L 10, W 19; tegmen 14–56. (Measurements from a paratype.)

Type—♂; Stubblefield Fall, Fairfax County, Virginia, July 4, 1918, on hickory, (W. L. McAtee), [W. L. M.]. *Paratypes* (2.8 mm.); Four-mile Run, Virginia, September 27, 1914, (W. L. McAtee), [W. L. M.].

Erythroneura maculata var. **bella** new variety

Like the red form of var. *maculata* except that the anterior two-thirds of the clavus and sometimes a spot on adjoining corium is red.

Length, 2.9 mm.; vertex: LM 6.5, LE 3, WA 11, WP 18.5, OA 5.5, OP 10, OH 15; pronotum: L 11, W 20; tegmen 13–59.

Type—♀; Plummer's Island, Maryland, Dec. 21, 1913, (W. L. McAtee), [W. L. M.]. *Paratypes* (2.83 mm.); same locality, Oct. 10, 1906, (A. K. Fisher) and October 26, 1913, (W. L. McAtee), [W. L. M.].

Erythroneura maculata var. **bella,** yellow form

Like the yellow form of variety *maculata* except that the anterior two-thirds of the clavus, and sometimes a small spot on adjoining corium, is red.

Length, 2.76 mm.; vertex: LM 7, LE 3.5, WA 11.5, WP 18.5, OA 6, OP 10, OH 15; pronotum: L 10, W 20; tegmen 14–60. Measurements from a female; Plummer's Island, Maryland, Sept. 13, 1914, (W. L. McAtee), [W. L. M.]. Other specimens (2.9 mm.) were collected at the same locality, July 27, September 13, (W. L. McAtee), [W. L. M.].

Erythroneura maculata var. **osborni** De Long

Typhocyba osborni. De Long, D. M. Jassoidea of Tennessee. Bull. 17, Tenn. State Bd. Ent., June, 1916, pp. 103 to 104. [Clarksville, Tennessee.]

Like the yellow form of variety *maculata* except that the basal third of tegmina (including basal two-thirds of clavi) is red.

Length, 2.9 mm.; vertex: LM 5.5, LE 3, WA 10.5, WP 17, OA 4.5, OP 10, OH 14; pronotum: L 9.5, W 18; tegmen 12–53. Measurements from a female; Oxford, Indiana, Nov. 1, 1914, (W. L. McAtee), [W. L. M.].

Through the kindness of Mr. D. M. DeLong, I have been permitted to examine specimens from the type lot, collected by Mr. DeLong at Clarksville, Tennessee, July 22 and 25, 1915.

Erythroneura maculata var. **bigemina** new variety

Scutellum and parts anterior pale yellowish; tegmina whitish hyaline, black dots on costal plaques and in bases of fourth apical cells.

Length, 2.7 mm.; vertex: LM 6, LE 3, WA 11, WP 16, OA 6, OP 9, OH 13; pronotum: L 9, W 18; tegmen 11–57.

Type—♀; Plummer's Island, Maryland, August 20, 1914, (W. L. McAtee), [W. L. M.]. *Paratypes* include specimens from the same locality as the type, dates from July 5 to September 14; Odenton, Maryland, July 29, 1917, on hickory; Beltsville, Maryland, June 9, 1915, Sept. 3, 1916; Dunn-Loring, Virginia, Aug. 30, 1916; Scott's Run to Balls Hill, Virginia, Aug. 12, 1917, (W. L. McAtee), [W. L. M.].

Erythroneura maculata var. **gemina** new variety

Whitish to pale yellowish, with only the dark spots in bases of fourth apical cells present.

Length, 2.68 mm.; vertex: LM 6, LE 3, WA 11, WP 17.5, OA 6, OP 10, OH 15; pronotum: L 10, W 19; tegmen 13–56.

Type—♀; Virginia opposite Washington, District of Columbia, June 15, 1902, [U. S. N. M.]. *Allotype*—♂; Scott's Run, Virginia, July 4, 1918, (W. L. McAtee), [W. L. M.]; this specimen is not in condition for measurement.

Erythroneura ligata new species

A species easily distinguished in its venational group by the broad zigzag scarlet vittae on tegmina, which enclose two pale saddle-spots, a smaller one on inner anterior portions of clavi and a larger one, embracing apical third of clavi and adjacent parts of corium. For further description, designation of type, etc., see account of typical variety.

Key to the Color Varieties

A. Head and pronotum with faint yellow markings, tip of clavus unmarked. var. **ligata** new variety, p. 301.

AA. Head and pronotum with red markings, tip of clavus with a red spot. var. **allecta** new variety, p. 302.

Erythroneura ligata var. **ligata** new variety

Ground color of scutellum and anterior parts ivory white, of tegmina whitish hyaline. Vertex with translucent to yellow spots, arranged as in *E. hartii*, three on transition from vertex to front, and four between eyes, of which the central pair are larger and may be connected with lateral spots or with posterior margin of vertex. Pronotum with two broad lateral, and two narrower discal vittae, which may be broken into smaller anterior and larger posterior spots, translucent to yellow. Scutellum with yellow basal triangles outlined by scarlet, apex yellow. Tegmina with broad zigzag scarlet vittae,

which enclose two pale saddle-spots, a smaller on inner anterior portions of clavi and a larger embracing posterior third of clavi and adjacent parts of corium; the anterior part of each vitta is confined to clavus, and the posterior part, after angling laterally to costal plaque returns to radial margin and ends abruptly at the cross-veins, a lateral prolongation following them to costal margin; a faint yellow dot at base of corium, usually an oblique yellow streak on anterior margin of costal plaque, plaque itself whitish, a black or bluish dot at its posterior margin, a dusky cloud in base of fourth apical cell, apical cells in general slightly fumose. Undersurface stramineous to yellowish.

Length, 2.9 mm.; vertex: LM 4, LE 6, WA 12, WP 21, OA 6, OP 11, OH 17; pronotum: L 12, W 22; tegmen 15–59.

Type—♂; Washington, District of Columbia, July, 1907, (Wm. Palmer), [U. S. N. M.]. *Paratypes*, same locality, May 28th, July 19th, (Wm. Palmer), (Otto Heidemann), [U. S. N. M.].

Erythroneura ligata var. **allecta** new variety

Like typical variety except that yellow markings of pronotum, vertex and costal margin are replaced by red; apex of scutellum and a spot near tip of clavus also red; touches of red on pleura and face in some specimens.

Length, 3.03 mm.; vertex: LM 6.5, LE 3.5, WA 14, WP 21.5, OA 7, OP 12, OH 17.5; pronotum: L 12, W 22; tegmen 15–60.

Type—♂; Washington, District of Columbia, July 19, [U. S. N. M.]. *Paratypes*—♂; labelled "Peab.", Uhler Collection, [U. S. N. M.].

Erythroneura infuscata Gillette

Typhocyba comes var. *infuscata*. Gillette, C. P. Am. Typhlocybinae, 1898, p. 764. [Type No. 3451, U. S. N. M., which is labelled "Agricultural College, Mississippi."].

Almost entirely smoky to black, and the only species so colored that is known in its group, namely those with the third sector and fourth apical vein practically continuous and the third and fourth cross-veins in a line almost at right angles to radial margin.

Smoky brown to black above, in some cases underlaid by deep dull red, a little paler at rondure of vertex, especially on sides, pronotum sometimes faintly paler on disc, and scutellum sometimes with a pale median vitta; tegmina with more or less hyaline spots at base, middle and apex of inner margin of clavus, middle of radial margin of fourth apical cell and on costal margin of second apical cell; costal plaque opaque whitish, tinged with red, an almost equal area of dull red just posterior, and costal margin and to some extent the cross-veins pencilled with dull red. Face and legs pale yellow more or less tinged or marked with red, remainder of under surface slaty, abdominal incisures, etc., sometimes pale yellow.

Length, 2.64 mm.; vertex: LM 7, LE 3, WA 11, WP 16.5, OA 5, OP 10, OH 14; pronotum: L 10, W 19; tegmen 14–54. (Type, a female.).

Other specimens examined include: a female from Onaga, Kansas, (F. F. Crevecoeur), [this is labelled Type No. 3440, U. S. N. M. and was part of the type material of *Eupteryx flavoscuta* Gillette]; a male from Plummer's Island, Maryland, March 24, 1907, (W. L. McAtee), [W. L. M.]. The species has been recorded also from Tennessee.

Erythroneura vitis Harris

Tettigonia vitis. Harris T. W. Encyclopedia Americana, VIII, 1831, p. 43.

It may be well to reproduce the brief original description of this species, as the obsolete work in which it was published is not everywhere available. The description of insect follows:

"It may be called *tettigonia vitis* (Harris). It is, in its perfect state, nearly one tenth of an inch long; of a straw color, with two broad, scarlet bands across the wing cases, one at the base and the other on the middle, and the tips of the wing cases are blackish."

No locality is mentioned, but Harris no doubt became acquainted with the insect in Massachusetts, which state is here designated as the type locality. In the first edition of a Report on the Insects of New England Injurious to Vegetation (1841, p. 184), Harris slightly amplifies the description of this insect. However, the original description is sufficient for identification as the species is the only one of its size (which alone places it in the *Eupterygidae*) that has a red band across the bases of the tegmina. Gillette[8] places *vitis* Harris as a variety of *comes* Say, but to the writer these forms do not appear to intergrade.

The known range of *E. vitis* extends from Maine, Quebec and Wisconsin to the District of Columbia, Mississippi, Kansas and Colorado.

Key to the Color Varieties

A. Anterior cross-band extending beyond apex of scutellum at least along costal margin; middle cross-band usually broader, extending to or beyond apex of clavus.

B. Middle cross-band or saddle-spot bounded by nearly or quite uninterrupted pale bands, like parentheses placed longitudinally on the insect.....var. **vitis** Harris, p. 304.

BB. Pale areas bounding middle cross-band interrupted or replaced by red markings.

[8]Am. Typhlocybinae, 1898, pp. 760 to 761.

C. Cross-band bounded by a wreath of pale spots, about three on each tegmen anteriorly and four posteriorly
var. **corona** new variety, p. 304.

CC. Cross-band bounded anteriorly by a more or less interrupted pale area, sometimes reduced to a single spot on clavus, and posteriorly broadly joined to red markings on cross-veins, leaving a pale area only at and adjacent to apex of clavus; the tegmen therefore chiefly red, sometimes with only two pale areas at base and apex of clavus, which latter the middle cross-band usually does not reach.
var. **bistrata** new variety, p. 305.

AA. Anterior cross-band not extending beyond apex of scutellum, middle cross-band narrower, not reaching apex of clavus.

B. Pronotum and scutellum chiefly red to dusky.
var. **stricta** new variety, p. 305.

BB. Pronotum and scutellum, and sometimes anterior cross-band chiefly yellow..... var. **stricta** new variety, yellow form, p. 306.

Erythroneura vitis var. **vitis** Harris

Bibliographical references same as for species.

Vertex yellowish with two parallel orange-reddish vittae, broader and deeper colored behind, sometimes almost wholly red; pronotum scarlet with a short median vitta in front, extreme anterior margin, and obsolete discal parentheses, pale yellow; scutellum chiefly scarlet, basal triangles and basal median vitta sometimes pale; tegmen with three cross-bands, the anterior scarlet extending well beyond apex of scutellum, the median scarlet (often paler red to dusky within), broad, from middle to near tip of clavus; those on the two tegmina together forming a large roundish saddle-spot, sometimes slightly projected along the sectors or connected to anterior band or posterior ramose line at a few points, and terminating laterally at costal plaque, which is blackish posteriorly and sometimes followed by a yellowish area; third cross-band made by the blackish apical cells which are hyaline basally; a ramose red line on cross-veins and adjoining parts of longitudinal veins. Under surface and legs chiefly pale yellow; mesosternum sometimes dark and pleura touched with red.

Length, 2.77 mm.; vertex: LM 7.5, LE 4, WA 13, WP 21, OA 7, OP 13, OH 16; pronotum: L 11, W 21; tegmen 15 to 56. Measurements from a female; Washington, District of Columbia, June 24, 1914, (L. O. Jackson).

Other specimens examined were collected at Plummer's Island, Maryland; Washington, District of Columbia, and Riley County, Kansas.

Erythroneura vitis var. **corona** new variety

Similar to variety *vitis* Harris, but middle cross-band on tegmina connected by red lines along longitudinal veins to anterior cross-band and to ramose marking on cross-veins, so that the saddle mark appears to be surrounded by a wreath of pale spots.

Length, 2.8 mm.; vertex: LM 7, LE 3.5, WA 15, WP 21, OA 7, OP 13, OH 17; pronotum: L 12, W 21.5; tegmen 13–56.

Type—♀; Plummer's Island, Maryland, July 19, 1914, (W. L. McAtee), [W. L. M.]. *Paratypes*, same locality as type, October, November, December; Great Falls, Maryland, May 23, and Washington, District of Columbia, October, 1895, (F. C. Pratt), July 15, and other specimens from grape, [U. S. N. M.].

Erythroneura vitis var. **bistrata** new variety

This variety illustrates the extreme degree of erythrization of this species I have seen; the vertex may be pale yellow, but usually it has the normal pair of vittae strongly developed, and it may be almost entirely red; the pronotum is red with touches of pale yellow on anterior border, with a dot in middle and traces of pale yellow at about two points on the hind margin; scutellum red with a pale median vitta enlarged at apex; tegmen often entirely red with the exception of a pale spot at inner base of clavus and another involving apex of clavus and adjoining corium; there may be other traces, however, of both anterior and posterior pale bands, and the costal plaque, except for its posterior blackish marking, and an equal sized area behind it and the bases of the apical cells are pale; undersurface and legs chiefly pale yellow.

Length, 2.83 mm.; vertex: LM 7, LE 3, WA 12, WP 19, OA 6, OP 11, OH 17; pronotum: L 12, W 22; tegmen 14–59.

Type—♂; Plummer's Island, Maryland, March 28, 1915, (W. L. McAtee), [W. L. M.]. *Paratypes* (2.64 to 2.97 mm.); from same locality as type, January, February, March, April, May, November, December; Maryland near Plummer's Island, January, and Bladensburg, Maryland, September 7, 1913, (W. L. McAtee), [W. L. M].

Erythroneura vitis var. **stricta** new variety

Ground color whitish hyaline to pale yellow; vertex chiefly pale, sometimes with a few touches of red, pronotum and scutellum chiefly red to dusky, the latter sometimes pale medianly and at tip; tegmen with three crossbands, the anterior red, narrow, not exceeding scutellum, the middle one narrower than in the other varieties, usually nearly quadrilateral in shape; the posterior much as in last variety, pale spaces between the bands broader than in the other varieties: usually half or more of costal plaque bluish or blackish, often overlaid by opaque white; lower surface stramineous to pale yellow.

Length, 2.8 mm.; vertex: LM 7, LE 3.5, WA 12, WP 19, OA 7, OP 11, OH 16; pronotum: L 11, W 20; tegmen 14–56. Measurements from a male; Washington, District of Columbia, October 18, 1895, on *Cercis canadensis*, [U. S. N. M.].

Type—♀; Oxford, Indiana, November 1, 1914, (W. L. McKee), [W. L. M.]. *Paratypes*, with same data, as measured specimen; Iowa City, Iowa, Sept. 24, 1915, (L. L. Buchanan), [W. L. M.]; Boulder, Colorado, December 5, 8, 1887, on grape, (C. S. Faurot); Philadelphia, Pennsylvania, July 10, 1880, on grape, (W. H. Batt), [U. S. N. M.]: same data as type; Plummer's Island, Maryland, November 30, 1913, September 13, 1914, July 14, 1915, (W. L. McAtee), [W. L. M.].

Erythroneura vitis var. **stricta** new variety, yellow form

Vertex, pronotum and scutellum chiefly yellow, the last two more or less underlaid by brownish; tegmen with three cross-bands, the anterior yellow to red, involving base of corium not beyond apex of scutellum and narrowly extended along costa, the median broad, semi-elliptical, red, duller within, terminating laterally in a blackish marking on posterior third of costal plaque; posterior cross-band formed by dusky clouds in apical cells; a branching red line on cross-veins and adjacent parts of longitudinal veins. Legs and face pale yellow; mesosternum black; body slaty with lighter edgings, varying to wholly pale yellowish.

Length, 2.8 mm.; vertex: LM 7, LE 3.5, WA 13.5, WP 21, OA 7, OP 12, OH 17; pronotum: L 11, W 22: tegmen 15-55.

Type—♀; labelled "Colo. 2186," [U. S. N. M.]. *Allotype*—♂; Riley County, Kansas, (Marlatt), [U. S. N. M.].

Erythroneura tricincta Fitch

E.[*rythroneura*] *tricincta*. Fitch, Asa. Cat. State Cabinet, N. Y., 1851, p. 63. Lintner Reprint, 1893, p. 403. [New York].

One of the most easily recognized species; with three distinct red or dusky cross-bands, the anterior not covering bases of tegmina; pale areas between the tegminal bands usually with longitudinal color streaks. Some of the more highly colored forms of this species, particularly those with red markings on vertex well developed, suggest affinity with *E. comes*; however, the anterior cross-band always is unlike any pronotal marking of the *comes* varieties, and the red or yellow markings on tegmina are long streaks along the veins, instead of irregular spots, often connected obliquely across tegmen as in *comes*.

The known range extends from New Hampshire Ontario and Wisconsin to North Carolina, Texas and Colorado.

Key to the Color Varieties

A. Cross-band one (anterior) involving base of scutellum.
  B. Cross-band one extending along sides of pronotum, leaving disc uncolored; cross-band two (middle) sanguineous to dusky, black on costa.
    C. Longitudinal color streaks present between cross-bands.
      D. Streaks red..... var. **calycula** new variety, p. 308.
      DD. Streaks yellow..var. **calycula** new variety, yellow form, p. 309.
    CC. Streaks obsolete..... var. **erasa** new variety, p. 309.
  BB. Cross-band one covering all of pronotum except a small part of anterior margin.
    C. Cross-bands one and two sanguineous to black.
      D. Longitudinal color streaks yellow...var. **tricincta** Fitch, p. 307.
      DD. Streaks red..... var. **tricincta** Fitch, red form, p. 308.
    CC. Cross-bands one and two bright red; longitudinal color streaks yellow.....var. **diva** new variety, p. 308.
AA. Cross-band one not covering base of scutellum.
  B. Cross-band one sanguineous to dusky, covering most of pronotum; cross-band two sanguineous to bright red, black on costa; cross-band three yellow-brown on apical half.
    C. Longitudinal color streaks red..var. **integra** new variety, p. 309.
    CC. Longitudinal color streaks yellow.
      var. **integra** new variety, yellow form, p. 309.
  BB. Cross-band one dusky to black, profoundly emarginate anteriorly, leaving a large part of disk of pronotum uncolored.
    C. Cross-band continuous across hind margin of pronotum.
      var. **cymbium** new variety, p. 310.
    CC. Cross-band (?) broadly interrupted, covering only sides of pronotum..... var. **disjuncta** new variety, p. 310.

Erythroneura tricincta var. **tricincta** Fitch

Bibliographical reference same as for species.

In this variety the anterior cross-band covers most of pronotum, as well as base of scutellum; cross-band two is sanguineous to dusky, terminating laterally in black, and the interspaces between cross-bands are streaked or even generally suffused with sulphur yellow. There is no doubt that this is the typical variety of Fitch; the anterior cross-band is as he described it, and he speaks of the whole insect as pale yellow, which he would not have done had he the red-streaked form before him.

Length, 2.7 mm.; vertex: LM 7, LE 4, WA 15, WP 21, OA 6.5, OP 12, OH 16; pronotum: L 10, W 21; tegmen 14–53. Measurements from a female; Plummer's Island, Maryland, July 19, 1914, W. L. McAtee.

Other specimens (2.64 to 2.7 mm.) examined were from the same locality as measured individual, March, April, August, September; Dead Run, Fairfax County, Virginia, April 6, 1913; Bluemont, Virginia, July 1, 1914, (W. L. McAtee); Iowa City, Iowa, June 11, 1915, (L. L. Buchanan), [W. L. M.]; Riley County, Kansas, July, (Marlatt); Iowa, (Gillette); Central Missouri, on grapevine, July, [U. S. N. M.].

Erythroneura tricincta var. **tricincta,** red form

Like the preceding but with longitudinal color streaks red; basal half of scutellum and most of pronotum covered by the dusky anterior cross-band; cross-band two sanguineous to dusky, bluish to black on costa.

Length, 2.77 mm.; vertex: LM 7, LE 3.5, WA 12.5, WP 19, OA 6.5, OP 10, OH 14; pronotum: L 10, W 19; tegmen 13–56. Measurements from a female; Plummer's Island, Maryland, March 28, 1915, (W. L. McAtee).

Other specimens (2.64 to 2.97 mm.) examined, from the same locality as the measured individual, January, March, April, December, (W. L. M.); Onaga, Kansas, (F. F. Crevecoeur); Clarksville, Tenn., April 28, 1909, [U. S. N. M.].

Erythroneura tricincta var. **diva** new variety

Cross-bands one and two chiefly bright red; cross-band one covering most of pronotum and base of scutellum, where its color sometimes is brownish yellow instead of red; cross-band two, bright red to costal plaque which is chiefly blackish, more or less overlaid by opaque white; longitudinal color markings sulphur yellow. This is Fitch's "var. a."

Length, 2.8 mm.; vertex: LM 7, LE 4, WA 13, WP 22, OA 7, OP 12, OH 16; pronotum: L 11, W 21; tegmen 14–55.

Type—♀; Plummer's Island, Maryland, July 26, 1914, (W. L. McAtee), [W. L. M.]. *Paratypes* (2.77 to 2.97 mm.) from same locality as type, January, September, October, December; Dyke, Virginia, May 19, 1918, (W. L. McAtee), [W. L. M.]: Riley County, Kansas, July (Marlatt); Washington, District of Columbia, May 30, 1896, [U. S. N. M.].

Erythroneura tricincta var. **calycula** new variety

Ground color ivory, a broad U-shaped dusky to black band on base of scutellum and sides of pronotum, the often concolorous eyes extending it on vertex; cross-band two sanguineous to dusky, black on costa; longitudinal color streaks red.

Length, 2.87 mm.; vertex: LM 7.5, LE 3.5, WA 13, WP 20, OA 6.5, OP 11.5, OH 16; pronotum: L 11, W 21; tegmen 13–58.

Type—♂; Plummer's Island, Maryland, December 14, 1913, (W. L. McAtee), [W. L. M.]. *Paratypes* from the same locality as type, January, March, November and December, (W. L. M.).

Erythroneura tricincta var. **calycula** new variety, yellow form

Like the preceding except that color streaks are yellow.

Length, 2.83 mm.; vertex: LM 7, LE 3.5, WA 14, WP 21, OA 6, OP 11.5, OH 14; pronotum: L 10, W 19; tegmen 13–58. Measurements from a male; Plummer's Island, Maryland, July 19, 1914, (W. L. McAtee), [W. L. M.].

Other specimens (2.7 to 2.9 mm.) from same locality, April, August, September and December, (W. L. M.).

Erythroneura tricincta var. **erasa** new variety

The U-shaped cross-band one, involving base of scutellum and sides of pronotum and cross-band two sanguineous to dusky, black on costa, but paler than in other varieties; longitudinal color streaks nearly or entirely obsolete.

Length, 2.8 mm.; vertex: LM 7, LE 3.5, WA 13, WP 21, OA 6, OP 12, OH 15; pronotum: L 10, W 20.5; tegmen 13–59.

Type—♀; Plummer's Island, Maryland, July 26, 1914, (W. L. McAtee), [W. L. M.]. *Paratypes*—♀; (2.6 mm.) Maywood, Virginia, February 20, 1916, (W. L. McAtee), [W. L. M.].

Erythroneura tricincta var. **integra** new variety

Cross-band one, sanguineous to dusky, confined to pronotum, most of which it covers; cross-band two bright red to sanguineous, bluish to black on costa; longitudinal color markings red.

Length, 2.8 mm.; vertex: LM 7, LE 3.5, WA 12.5, WP 20.5, OA 7, OP 12, OH 15; pronotum: L 10, W 20; tegmen 13–58.

Type—♀; Plummer's Island, Maryland, March 28, 1915, (W. L. McAtee), [W. L. M.]. *Paratypes* (2.7 to 2.97 mm.) from same locality as type, March and November.

Erythroneura tricincta var. **integra** new variety, yellow form

Like the preceding except that longitudinal color streaks are yellow.

Length, 2.8 mm.; vertex: LM 7, LE 3.5, WA 12, WP 19.5, OA 7, OP 11.5, OH 14; pronotum: L 11, W 19.5; tegmen 14–57. Measurements from a female; Plummer's Island, Maryland, July 26, 1914, (W. L. McAtee), [W. L. M.].

Other specimens (2.64 to 2.9 mm.) examined from same locality as measured individual, July, December, (W. L. M.).

Erythroneura tricincta var. **cymbium** new variety

Cross-band one, dusky to black confined to pronotum, profoundly emarginate anteriorly, leaving a large part of disk uncolored: cross-band two sanguineous to red, bluish to black on costa; longitudinal color streaks yellow.

Length, 2.73 mm.; vertex: LM 7, LE 3.5, WA 11.5, WP 18, OA 6, OP 9, OH 13.5; pronotum: L 9, W 19; tegmen 13–56.

Type—♀; Benton Harbor, Michigan, May 28, 1912, on grape, (E. H. Seigler), [U. S. N. M.]. *Paratypes* (2.7 to 2.83 mm.), same data as type; Northeast, Pennsylvania, June 6, 1912, (F. Johnson), Quaintance No. 6994; Dallas, Texas, September 12, 1907, on grape, (F. C. Bishopp), [U. S. N. M.].

Erythroneura tricincta var. **disjuncta** new variety

Like the last, but cross-band (if it may be so called) one, broadly interrupted in the middle, covering only sides of pronotum.

Length, 2.8 mm.; vertex: LM 6.5, LE 3.5, WA 10.5, WP 18, OA 6.5, OP 10, OH 14.5, pronotum: L 10, W 19; tegmen 14–57.

Type—♀; Northeast, Pennsylvania, June 6, 1912, (F. Johnson), Quaintance No. 6994, [U. S. N. M.]. *Paratype*—♀; (2.8 mm.)same place and collector as type, June 27, 1912, Quaintance No. 9015.

Erythroneura comes Say

T.[*ettigonia*] *comes*. Say, Thomas. Desc. New Hem. Ins., Journ. Ac. Nat. Sci. Phila., IV, 1825, p. 343; Compl. Writings, II, 1859, p. 259. [Missouri.]

Among species of its group, with third and fourth cross-veins in line approximately at right angles to the radial margin (fig. 12), *E. comes* is distinguished by its basic color pattern of yellow to red, irregular spots, of which three (the upper two sometimes fused) are on clavus, and those on corium tend to be arranged in three oblique series. In some of the varieties these markings tend to be greatly extended, resulting in various distinct color patterns, or to fuse into red, through sanguineous to dusky longitudinal angulate vittae. Small dusky to black dots usually are present in the base of fourth apical cell, in the apices of second and fourth apical cells, and on posterior half of costal plaque; in some varieties there are additional dark markings. The black dots or clouds in apices of second apical cells appear to be diagnostic of *comes* and to afford a means of recognizing the species in the few cases in which the fourth cross-vein is oblique, a character which, otherwise, would throw the specimen into the *maculata* group. *E. comes* ranges over the whole United States and southern Canada.

Key to the Color Varieties

A. Upper surface with distinct color markings.
  B. Dominant markings sanguineous to dusky angulate vittae extending from humeri to cross-veins; apex of clavus with a marking not involved in the longitudinal vittae.
    C. Sanguineous vitta extending from humerus to costal plaque, thence to cross-veins; upper surface, from scutellum to cross-veins, occupied by a pale diamond-shaped saddle spot traversed by red streaks. var. **cancellata** new variety, p. 320.
    CC. Sanguineous to dusky vitta extending from humerus onto clavus, leaving a pale area anterior to costal plaque; dorsal saddle spot vase-shaped ornamented by red to yellow spots.
      D. Color markings other than angulate vittae, yellow. var. **ziczac** Walsh, p. 320.
      DD. Color markings other than angulate vittae, red. var. **ziczac** Walsh, red form, p. 320.
  BB. Dominant markings otherwise, or if they are angulate vittae, they are either not sanguineous to dusky, or not unicolorous, or not continuous from humeri to cross-veins.
    C. Dorsal surface with dark markings other than the usual spots on costal plaques and in the apical cells.
      D. Tegminal vittae dusky, interrupted behind costal plaque by a broad transverse whitish hyaline area; pronotum and basal triangles of scutellum ruby-red, apex of scutellum narrowly margined with black ..... var. **venusta** new variety, p. 319.
      DD. Tegminal vittae or spots red to yellow.
        E. Scutellum without dark markings; spots on inner margins of clavi black.
          F. Tegmina whitish hyaline, almost lacking color markings. var. **octonotata** Walsh, p. 317.
          FF. Tegmina with well developed color markings.
            G. Color markings red.. var. **accepta** new variety, p. 317.
            GG. Color markings yellow. var. **accepta** new variety, yellow form, p. 318.
        EE. Scutellum with dark markings.
          F. Scutellum with a median vitta, or the apex black.
            G. Scutellum with a median black vitta sometimes developed only basally; black spots on clavi; tegminal markings in the form of spots.
              H. Color markings red.. var. **compta** new variety, p. 318.
              HH. Color markings yellow. var. **compta** new variety, yellow form, p. 318.
            GG. Scutellum with the apex and apical part of sides black; most of clavus and a band between clavus and costal plaques red..... var. **amanda** new variety, p. 319.
          FF. Scutellum with the basal triangles black; color markings red. var. **coloradoensis** Gillette, p. 318.

CC. Dorsal surface without dark markings other than on costal plaques and in apical cells.
D. Ground color milky white, nearly opaque.
E. Color markings red..... var. **delicata** new variety, p. 317.
EE. Color markings yellow.
var. **delicata** new variety, yellow form, p. 317.
DD. Ground color otherwise.
E. Dorsal surface of abdomen chiefly dark, showing through the whitish to greenish-yellow hyaline tegmina; color markings often less contrasted, the red of a vermilion hue (jasper red).
F. Color markings usually paler within, covering half or more of tegmina..... var. **rubra** Gillette, p. 315.
FF. Color markings not paler within, covering less than half of tegmina..... var. **rubrella** new variety, p. 316.
EE. Dorsal surface of abdomen usually pale; color markings (when red more contrasted), paler than jasper red.
F. Tegminal markings rather attenuate and more or less interrupted.
G. Color markings red..... var. **comes** Say, p. 312.
GG. Color markings yellow.
var. **comes** Say, yellow form, p. 313.
FF. Tegminal markings broader and more fused.
G. Markings narrower, interrupted by sanguineous, only at middle, if at all; a color mark on apex of clavus.
H. Color markings red..... var. **vitifex** Fitch, p. 314.
HH. Color markings yellow.
var. **vitifex** Fitch, yellow form, p. 314.
GG. Markings broader, pale red to sanguineous, outlined by brighter red; apex of clavus pale.
var. **elegans** new variety, p. 315.
AA. Upper surface pale yellowish to whitish hyaline; apical cells somewhat fumose..... var. **nudata** new variety, p. 316.

Erythroneura comes var. **comes** Say

T.[ettigonia] comes. Say, Thomas. Desc. New Hem. Ins., Journ. Ac. Nat. Sci., Phila., IV, 1825, p. 343; Compl. Writings. II, 1859, p. 259. [Missouri.]

The "*comes*" type of coloration has been referred to several times in preceding pages; conception of it is based on this variety which on account of its prior description has been taken as a standard for comparative remarks. The essential features of the "*comes*" color pattern are: vertex with an inverted narrowly U-shape vitta connected to spots on inner sides of orbits, or these

markings more or less interrupted; pronotum with simple longitudinal vittae on sides and a Y-shaped vitta on disk, also often broken up into spots; scutellum with basal triangles outlined, and apex touched with color, clavus with three irregular spots, the upper two of which often are united; corium with an oblique streak near base, costal plaque margined on front and inner side by a color streak, which sends a branch toward middle of clavus, and is extended posteriorly, joining a ramose marking on crossveins at juncture of third and fourth veins, this entire vitta often more or less interrupted. There is an oblique dark streak across posterior part of costal plaque and dark dots at base of fourth apical, and at apex of second apical cells.

It is convenient to separate specimens with narrower, often interrupted markings from those with heavier, continuous color vittae. Say's description evidently applies to the former, and Fitch's description of *vitifex* to the latter. Say refers to the color spots as sanguineous, hence the red phase must be considered typical of the variety *comes*.

Length, 2.7 mm.; vertex: LM 7, LE 3.5, WA 11.5, WP 18, OA 6, OP 10, OH 14; pronotum: L 10, W 19; tegmen 12–56. Measurements from a female; Washington, District of Columbia, October 10, 1885, (C. L. Marlatt), [U. S. N. M.].

Other specimens (2.64 to 2.83 mm.) examined were from North East Pennsylvania, May 10, 1912 (Quaintance No. 6967), May 20, 1912 (Q. No. 6975), August 24, 1912 (Q. No. 9023), (F. Johnson); Stirling, Virginia, October 9; Washington, District of Columbia, January 1879, sieved; Riley County, Kansas, July, (Marlatt), and others less definitely labelled, [U. S. N. M.]: Beltsville, Maryland, May 2, 1915, exceedingly abundant and almost all in copula, on *Rubus*; March 2, 1913, in sphagnum; Plummer's Island, Maryland, March 14, 1915; Oxford, Indiana, November 1, 1914, (W. L. McAtee), [W. L. M.].

Erythroneura comes var. **comes** Say, yellow form

Like the preceding except that color markings are yellow.

This form was abundant on *Rubus* at Beltsville, Maryland, May 2, 1915, when it was found in copula with others of its kind, and also with the red form. Other specimens (2.7 to 3.1 mm.) examined from the same locality, May 25, 1919; Plummer's Is-

land, Maryland, July 26, Oct. 4, 1914; Great Falls, Maryland, Aug. 18, 1917; Odenton, Maryland, July 20, 1917, on *Vitis*, July 10, 1918; Scott's Run to Ball's Hill, Virginia, August 12, 1917, in copula, (W. L. McAtee), [W. L. M.]. North East, Pennsylvania, May 20, 1912 (Quaintance Nos. 6974, 5), May 24, 1912 (Q. No. 6982), May 28, 1912 (Q. No. 6987), August 22, 1911 (Q. No. 6932), August 24, 1912 (Q. No. 9023), (F. Johnson); Mt. Airy, Pennsylvania, July 9, 1894; Kelly's Island, Ohio, July 18, 1911 (Q. No. 6938); Washington, District of Columbia, June 10, and others less definitely labelled, [U. S. N. M.].

Erythroneura comes var. **vitifex** Fitch

Erythroneura vitifex. Fitch, Asa. Insects Infesting Fruit Trees, Trans. N. Y. Agr, Soc., xvi, 1856, pp. 392 to 393. [New York.]

Tegminal markings red, confluent into two zigzag vittae, each of which extends from humerus to middle of clavus, thence to posterior half of costal plaque thence to fourth cross-vein; these vittae enclose a heart-shaped pale spot, anteriorly, which involves inner bases of clavi and apex of scutellum, and a diamond-shaped pale spot, posteriorly, in the center of which is a red spot on the tips of the clavi. The head has a broad wedge-shaped vitta with a narrow median pale streak and the pronotum, two lateral simple vittae and a median Y-shaped one.

Length, 2.73 mm.; vertex: LM 7, LE 3:5, WA 12, WP 19, OA 6, OP 11, OH 16; pronotum: L 11, W 21; tegmen 13–56. Measurements from a male; Plummer's Island, Maryland, January 11, 1914, (W. L. McAtee).

Other specimens (2.64 to 2.73 mm.) examined were from same locality as measured individuals, March, April, July, August, October, November, December; Oxford Indiana, November 1, 1914, (W. L. McAtee), [W. L. M.]: Pawling, New York, (A. L. Marshall); Washington, District of Columbia, Oct. 10, (C. L. Marlatt), Oct. 1, 1895, July 21, 1885, at light; Taresdale, Virginia, April 26, 1886, on grape, (D. Rhind); Madison, Wisconsin, Sept. 17, 1880, (W. A. Henry); Michigan (1971); Iowa (129); Riley County, Kansas, July, (Marlatt); Wichita Falls, Texas, Feb. 17, (Quaintance No. 7793), (J. H. Stokes); Las Cruces, New Mexico, Oct. 12, on *Vitis vinifera*, (T. D. A. Cockerell), [U. S. N. M.].

Erythroneura comes var. **vitifex** Fitch, yellow form

The shape and extent of the markings in variety *vitifex* are much the same as in variety *ziczac*, but the color bright red instead

of blood-brown; in the yellow variety of *ziczac* it is the subsidiary markings, not the principal vittae, that are yellow, but a yellow form of *vitifex* has been found in which all of the color markings are affected. Various intergrades between the red and yellow forms occur as those with color markings on head or even all in front of costal plaques yellow, the remainder red, or those with the anterior markings and tips of clavi yellow, the remainder red.

Length, 2.73 mm.; vertex: LM 7, LE 3.5, WA 12, WP 19.5, OA 6.5, OP 11, OH 16; pronotum: L 11, W 20.5; tegmen 14–55. Measurements from a female; Washington, District of Columbia, July 21, 1913, (W. L. McAtee).

Other specimens examined (2.64 to 2.72 mm.), Plummer's Island Maryland, Sept. 12, 1914, (W. L. McAtee), [W. L. M.].

Erythroneura comes var. **elegans** new variety

This variety differs from *vitifex* in having broader tegminal vittae, pale bluish-red to dusky within, brighter margined, which are in touch for a greater distance along the commissure (at middle of clavus); the posterior pale spot enclosed by them is less extensive and the tips of the clavi are not marked with red; the latter feature distinguishes this variety, also from var. *rubra*.

Length, 2.6 mm.; vertex: LM 6, LE 3, WA 11, WP 17.5, OA 5.5, OP 10.5, OH 15; pronotum: L 10, W 19; tegmen 12–55.

Type—♂; Plummer's Island, Maryland, Jan. 11, 1914, (W. L. McAtee), [W. L. M.]. *Paratypes* (2.54 to 2.83 mm.); same locality as type, March, April, October, November, December; Oxford, Indiana, Nov. 1, 1914, (W. L. McAtee); Iowa City, Iowa, Oct. 30, 1915, (L. L. Buchanan); Denver, Colorado, Sept. 11, 1914, (E. C. Jackson), [W. L. M.]: North East, Pennsylvania, May 16, 1912 (Quaintance No. 6969), (F. Johnson), [U. S. N. M.].

Erythroneura comes var. **rubra** Gillette

Typhlocyla comes var. rubra. Gillette, C. P. Am. Typhlocybinae, 1898, p. 764. [Type No. 3450, U. S. N. M., which is labelled, "Mich. 1972."]

In this variety all of the color markings are broadened, the vittae on head and usually a short-armed Y-shaped vitta on pronotum being unusually heavy, and the tegminal markings occupying more than half of the tegminal surface; the apex of the clavus is red and the vitta between it, posterior part of costal plaque and cross-veins is particularly broad; the costa posterior to costal plaque also is often red. The red markings vary in shade from a pale bluish red outlined in brighter color, to a solid

vermilion-red (jasper red); all specimens have the upper surface of abdomen dark, and in those with jasper red markings this color, showing through the often yellowish tegmina, gives insects of this variety a peculiar appearance, that differentiates them from all of the other varieties except the next following.

Length, 3 mm.; vertex: LM 6.5, LE 3, WA 15, WP 21, OA 7, OP 12, OH 17; pronotum: L 11, W 22; tegmen 13–60. *Type*, a female.

Other specimens examined, (2.57 to 3 mm.); Plummer's Island, Maryland, March, June, July, November, December; Great Falls, Virginia, April 20, 1916; Odenton, Maryland, July 14, 1918, (W. L. McAtee); Iowa City, Iowa, April 6, 1915, (L. L. Buchanan), [W. L. M.].

Variants of *rubra* occur with the color markings on anterior part of dorsum yellow, those posterior red; hence it is probable that an entirely yellow-marked form will be found.

Erythroneura comes var. **rubrella** new variety

Differs from the last chiefly in the smaller extent to which the tegmina are covered by the color markings, but it may be remarked that the narrower tegminal vittae of this variety are uniform in color, while the broader vittae of the preceding variety are almost always paler within, and often a bluish red, margined by deeper color; tegminal markings in the present variety usually vermilion (jasper red) and occupying less than half of the tegminal surface.

Length, 2.3 mm.; vertex: LM 6, LE 3, WA 11, WP 17.5, OA 5.5, OP 10, OH 14; pronotum: L 10, W 18; tegmen 12–52.

Type—♂; Plummer's Island, Maryland, Nov. 30, 1913, (W. L. McAtee), [W. L. M.]. *Paratypes* (2.3 to 2.7 mm.) from same locality as type, January, March, July, November, December; Great Falls, Virginia, July 25, 1914; Maywood, Virginia, February, March; Scott's Run to Ball's Hill, Fairfax County, Virginia, Aug. 12, 1917, (W. L. McAtee), [W. L. M.]: Paris, Fauquier County, Virginia, July 29, 1898, [U. S. N. M.].

Erythroneura comes var. **nudata** new variety

Color of scutellum and anterior parts pale yellowish with irregular pellucid areas, instead of the color vittae and spots usually present in other varieties; tegmina whitish hyaline, apical cells somewhat fumose; costal plaque rather opaque white, an oblique black streak across it posteriorly, and black dots in bases of fourth apical, and apices of second apical cells. Placed as a variety of *comes* because of the presence of dark spots in apices of second apical cells, although so far as coloration goes no intergrading specimens have been seen.

Length, 2.64 mm.; vertex: LM 7.5, LE 4, WA 11.5, WP 18, OA 6.5, OP 9, OH 14; pronotum: L 10, W 19; tegmen 12–51.

Type—♀; Odenton, Maryland, July 29, 1917, on *Vitis*, (W. L. McAtee), [W. L. M.]. *Allotype*—♂; same data.

Erythroneura comes var. **delicata** new variety

Ground color opaque milky white, with red color markings of the *comes* type, the spots usually small and well separated.

Type—♀; Plummer's Island, Maryland, July 26, 1914, (W. L. McAtee), [W. L. M.].

Specimens (2.68 to 2.83 mm.) from Plummer's Island, Maryland, July 26, 1914, Oct. 4, 1914, Oct. 28, 1913; Great Falls, Maryland, Aug. 18, 1917, Odenton, Maryland, July 29, 1917, on *Vitis*, (W. L. McAtee); Anacostia, District of Columbia, April 30, 1913, (W. D. Appel), [W. L. M.].

Erythroneura comes var. **delicata,** yellow form

Like the preceding, but color markings yellow.

Length, 2.83 mm.; vertex: LM 7, LE 4, WA 12, WP 20, OA 6.5, OP 12, OH 16; pronotum: L 11, W 21; tegmen 13–59.

Erythroneura comes var. **octonotata** Walsh

Erythroneura octo-notata. Walsh, B. D. Prairie Farmer, Sept. 6, 1862, p. 149. [Illinois.]

The essential part of Walsh's description is: "Elytra whitish hyaline, with the same three spots as in the preceding [*zizac*], and in addition one on the inner margin not far from the base." This variety, therefore, is an almost colorless form with four black dots on each tegmen; highly colored forms having these dots and those having a black vitta on scutellum should be extended. I have seen no specimen that exactly fits Walsh's description, but he notes "I have examined some dozen specimens," so that it is probable the very pale form he describes is common somewhere in Illinois.

Erythroneura comes var. **accepta** new variety

With the black tegminal spots as in variety *octonotata* Walsh, and in addition, red color markings of the *comes* or *vitifex* type.

Length, 2.83 mm.; vertex: LM 7, LE 3.5, WA 12, WP 20, OA 6, OP 10, OH 15; pronotum: L 11, W 20.5, tegmen 13–60.

Type—♀; Plummer's Island, Maryland, Dec. 14, 1913, (W. L. McAtee). Other specimens from Plummer's Island, Maryland, March 14, 1915, September 13, 1914 and December 21, 1913, (W. L. McAtee), [W. L. M.].

Erythroneura comes var. **accepta** new variety, yellow form

Similar to the preceding, but with yellow color markings.

Length, 2.9 mm.; vertex: LM 7.5, LE 4, WA 12, WP 19, OA 6.5, OP 10,5, OH 15; pronotum: L 11, W 20; tegmen 13–59. Measurements from a female; Odenton, Maryland, July 29, 1917, on *Vitis*, (W. L. McAtee), [W. L. M.]. Another specimen (2.77 mm.), same data.

Erythroneura comes var. **compta** new variety

Typhlocyba comes var. *octonotata*. Gillette, C. P. Am. Typhlocybinae, 1898, pp. 762 to 763, not of Walsh, which see.

With the black tegminal spots of variety *octonotata*, red color markings of the *comes* or *vitifex* type, and in addition a broad, median black vitta on scutellum which usually, though not always leaves a round spot on apex of scutellum pale.

Length, 2.64 mm.; vertex: LM 6.5, LE 3, WA 11, WP 17.5, OA 5.5, OP 9.5, OH 14; pronotum: L 10, W 19; tegmen 12–56.

Type—♀; Plummer's Island, Maryland, March 28, 1915, (W. L. McAtee). *Paratypes* (2.3 to 2.7 mm.) from Plummer's Island, Maryland, Dec. 21, 1915; Oxford, Indiana, Nov. 1, 1914, (W. L. McAtee), [W. L. M.]: Illinois (1992); Stirling, Virginia, Oct. 9, [U. S. N. M.].

Erythroneura comes var. **compta** new variety, yellow form

Like the preceding, but color markings yellow.

Length, 2.93 mm.; vertex: LM 6.5, LE 3.5, WA 10.5, WP 16.5, OA 6, OP 9.5, OH 14; pronotum: L 10, W 18; tegmen 15–55. Measurements from a male; Anacostia, District of Columbia, April 20, 1913, (W. D. Appel), [W. L. M.].

Other specimens (2.56 to 2.7 mm.), are from Odenton, Maryland, July 29, 1917, on *Vitis*; Dyke, Virginia, May 28, 1913; Scott's Run, Fairfax County, Virginia, July 4, 1918, (W. L. McAtee, [W. L. M.]: Agricultural College, Michigan, 5–11–91; Agricultural College, Mississippi, October 8, 1894, (H. E. Weed); Florence, Alabma, Aug. 20, 1897, on grape, [U. S. N. M.].

Erythroneura comes var. **coloradoensis** Gillette

Typhlocyba vitifex var *coloradoensis*. Gillette, C. P. Observations upon Injurious Insects, Season of 1891. Bull. 19, Colo. Agr. Exp. Sta., May, 1892, p. 16, fig 8. [Colorado.]

Typhlocyba comes var. *coloradensis*. Gillette, C. P. Am. Typhlocybinae, 1898, p. 763.

This variety has red markings of the *comes* or *vitifex* type, and in addition distinct black spots in the basal triangles of the scutellum; the black streak on costal plaque and black clouds in bases of fourth, and in apices of second apical cells seem unusually distinct; dorsum of abdomen and tip of genitalia also black.

Length, 2.87 mm.; vertex: LM 6, LE 3, WA 13, WP 21, OA 6, OP 12, OH 16; pronotum: L 10.5, W 22; tegmen 14–61. Cotypes, a female and male; Colorado, No. 1854 (Type No. 3447, U. S. N. M.)

Other specimens examined: Riley County, Kansas, July, (Marlatt); Basco, Illinois, January, 1861, (G. Marlatt); Sonoma County, California, (A. E. Bush); Bloomington, Nebraska, on grape, 1888, (J. Graf); Anthony, New Mexico, on grape, August 8, 1889, (H. H. Bailey); Denver, Colorado, on grape, July 28, 1886, (V. Devinney); California, [U. S. N. M.]: Denver, Colorado, Sept., Oct., Nov., 1914, (E. C. Jackson), [W. L. M.].

Erythroneura comes var. **amanda** new variety

Apical third, or at least the sides of scutellum, apically, dusky to black; anterior two-thirds of clavus and a band between clavus and costal plaque bright red; subsidiary markings of tegmen tending to be red anteriorly and yellow posteriorly; markings of head and pronotum yellow.

Length, 2.54 mm.; vertex: LM 6.5, LE 3, WA 11, WP 17.5, OA 6, OP 9.5, OH 14; pronotum: L 10, W 19; tegmen 11–52.

Type—♂; Central Missouri, July, on grape, [U. S. N. M.]. *Paratypes* (2.37 to 2.57 mm.) include some specimens with same, and others with less significant data than type, most of them however from grape, [U. S. N. M.].

Erythroneura comes var. **venusta** new variety

Vertex chiefly dusky, narrow anterior border and median streak pale yellow; thorax and basal triangles of scutellum deep ruby-red, apex black; broad dusky vitta on tegmen occupying anterior two-thirds of clavus and an oblique area on corium from clavus to black marking on costal plaque; tegmen from posterior edge of this band to cross-veins whitish-hyaline; apical cells chiefly dusky; undersurface pale yellow.

Type—♀; Odenton, Maryland, July 29, 1917, on *Vitis*, (W. L. McAtee), [W. L. M.]; in too distorted a pose for measurement.

Erythroneura comes var. **ziczac** Walsh

Erythroneura ziczac. Walsh, B. D. Fire-blight. Two new foes of the apple and pear. The Prairie Farmer, 10, No. 10, Sept. 6, 1862, p. 149. [Illinois.]

Ground color pale yellow; sides of thorax and scutellum, and angulate vittae on tegmina running from humeri over middle of clavi, thence to inner edges of costal plaques thence to cross-veins near radial margin, sanguineous to dusky. Costal plaque pale yellow, more or less overlaid by white with an oblique black streak posteriorly; costa both in front of and behind costal plaque pale yellow; apical cells chiefly dusky, paler within two and four, in effect producing an irregular oblique dusky vitta from base of fourth cell to apex of second. The vase-shaped saddle spot is marked with yellow at least at apices of clavi. Lower surface stramineous to pale yellow.

Length, 2.83 mm.; vertex: LM 7.5, LE 3.5, WA 13.5, WP 20.5, OA 6.5, OP 11, OH 16; pronotum: L 11, W 21; tegmen 13–59. Measurements from a female, Plummer's Island, Maryland, July 19, 1914, (W. L. McAtee.).

Other specimens (2.73 to 2.83 mm.) examined; from same locality as measured individual, July, August, October, (W. L. McAtee); Denver, Colorado, Sept. 11, 1914, (E. C. Jackson), [W. L. M.]; Riley County, Kansas, July, (Marlatt), [U. S. N. M.].

Erythroneura comes var. **ziczac,** red form

In this form the apex of scutellum, tips of clavi, two oblique streaks in front of costal plaque, and other traces of *comes* type of markings (some of them apparently overlaid by longitudinal dusky vittae) are red.

Length, 2.7 mm.; vertex LM 7, LE 4, WA 12, WP 19, OA 7, OP 10, OH 16; pronotum: L 10.5, W 21; tegmen 14–55. Measurements from a male; Plummer's Island, Maryland, Dec. 14, 1913, (W. L. McAtee).

Other specimens (2.67 to 2.87) examined from same locality as measured individual, January, April, August, September, November, (W. L. McAtee, L. O. Jackson), [W. L. M.]; Michigan, No. 1970, [U. S. N. M.].

Erythroneura comes var. **cancellata** new variety

Vertex and pronotum dusky sanguineous, the usual vittae barely distinguishable by their brighter red color; scutellum sanguineous except broad median pale vitta, and bright red tip; on each tegmen a broad sanguineous vitta from humerus to costal plaque and from costal plaque to cross-veins near radial margin; these vittae enclose (with pale area on scutellum) a large pale diamond-shaped saddle-spot, extending from base of scutellum to cross-veins which is ornamented by bright red markings as follows; tip of scutellum and of clavus, a V-shaped marking on middle of each clavus, connected by a short oblique streak to longitudinal sanguineous vitta near posterior end of costal plaque. Costal plaque pale yellow, an oblique black streak posteriorly,

more or less overlaid by opaque white; costa between plaque and cross-veins pale yellow, a ramose red marking on cross-veins; apical cells dusky except extreme bases of all, and the central interior of two and four; a little blacker at base of four and at apices of two and four. Pale yellow below, face with touches of red, and genitalia more or less livid to slaty.

Length, 3.13 mm.; vertex: LM 7, LE 3.5, WA 15, WP 22, OA 6.5, OP 13, OH 17; pronotum: L 11.5, W 22; tegmen 15–62.

Type—♀; Plummer's Island, Maryland, Nov. 30, 1913, (W. L. McAtee), [W. L. M.]. *Paratype*—♀; (2.93 mm.), same locality as type, May 4, 1914, (W. L. McAtee), [W. L. M.].

A large well-marked form, which is given varietal rank because it is assumed intergrades with *comes* may exist; further evidence may indicate the advisability of considering this form a species

Explanation of Plates

As to Vertex

Fig. 1.—*bipunctata*, the only species of this type.

Fig. 2.—*ador*, the only species of this type.

Fig. 3.—*abolla; dentata, morgani, scutelleris, basilaris, maculata* and *ligata* are of about the same type.

Fig. 4.—*obliqua: rubroscuta, crevecoeuri, illinoiensis, hartii, vitis, tricincta* and *comes* are of about the same type.

Fig. 5.—*vulnerata; aclys* and *infuscata* are similar.

Fig. 6.—*tecta*, the only species of this type.

As to Apical Cells

Fig. 7.—*vulnerata*, the only species of this type.

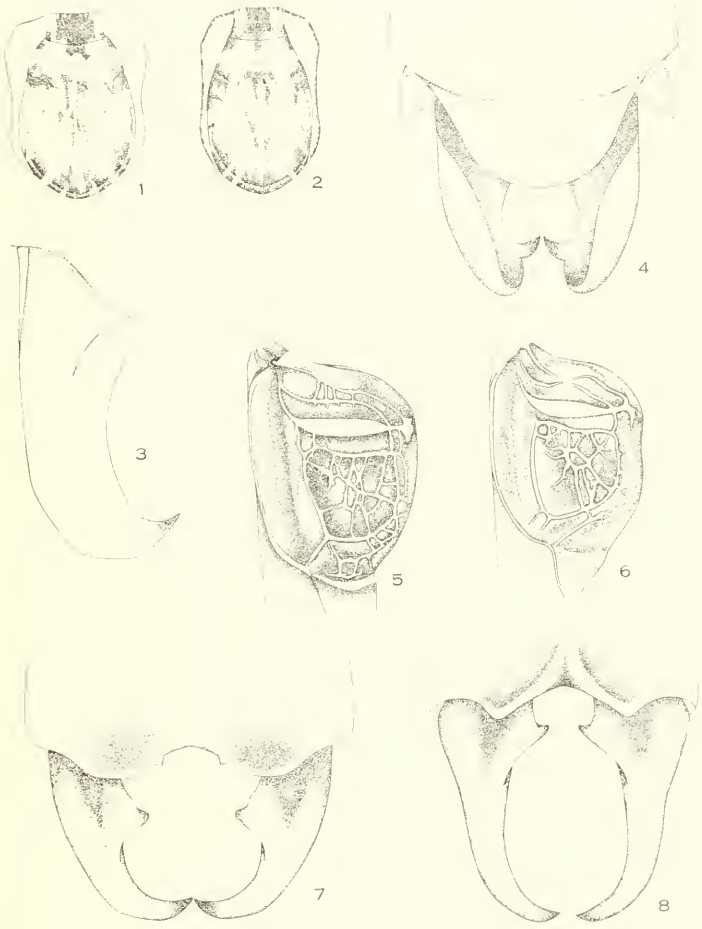
Fig. 8.—*obliqua; rubroscuta* and *crevecoeuri* are similar.

Fig. 9.—*tecta: bipunctata, ador, dentata, abolla, aclys, morgani* and *hartii* are of about the same type.

Fig. 10.—*illinoiensis; scutelleris* is much the same.

Fig. 11.—*maculata; basilaris* and *ligata* are similar.

Fig. 12.—*comes infuscata, vitis* and *tricincta* are of the same type.



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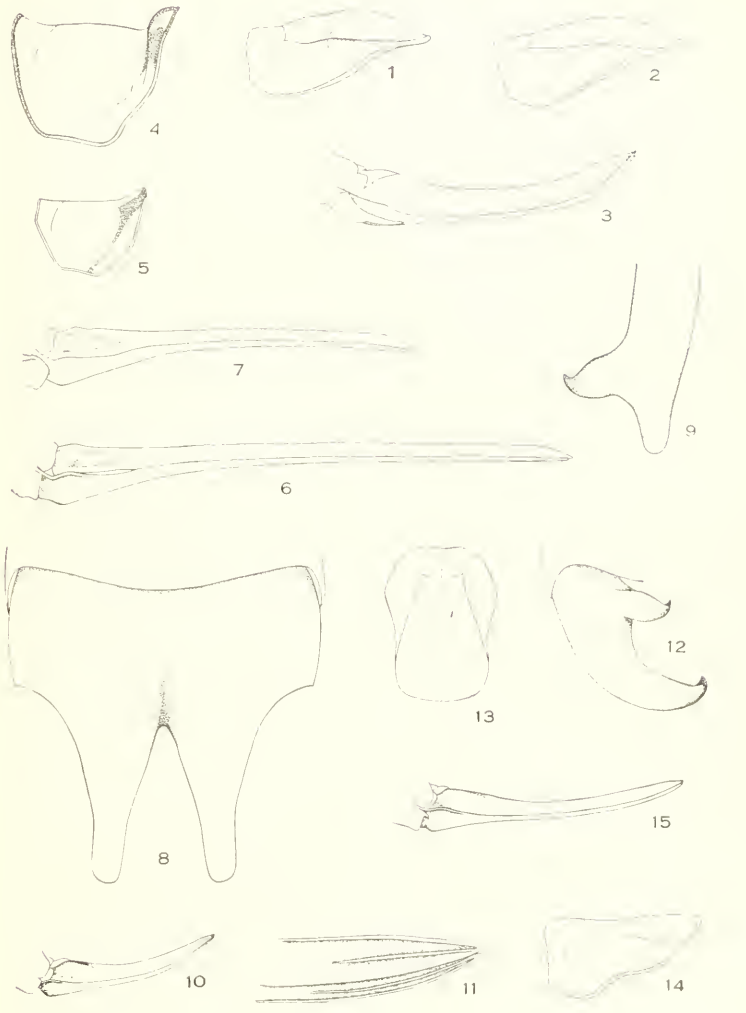

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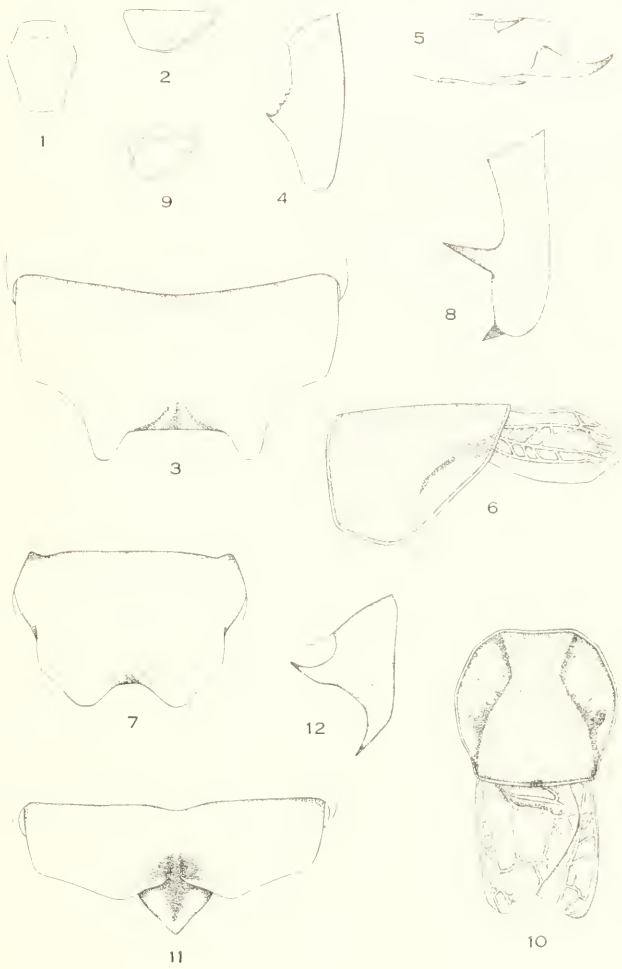

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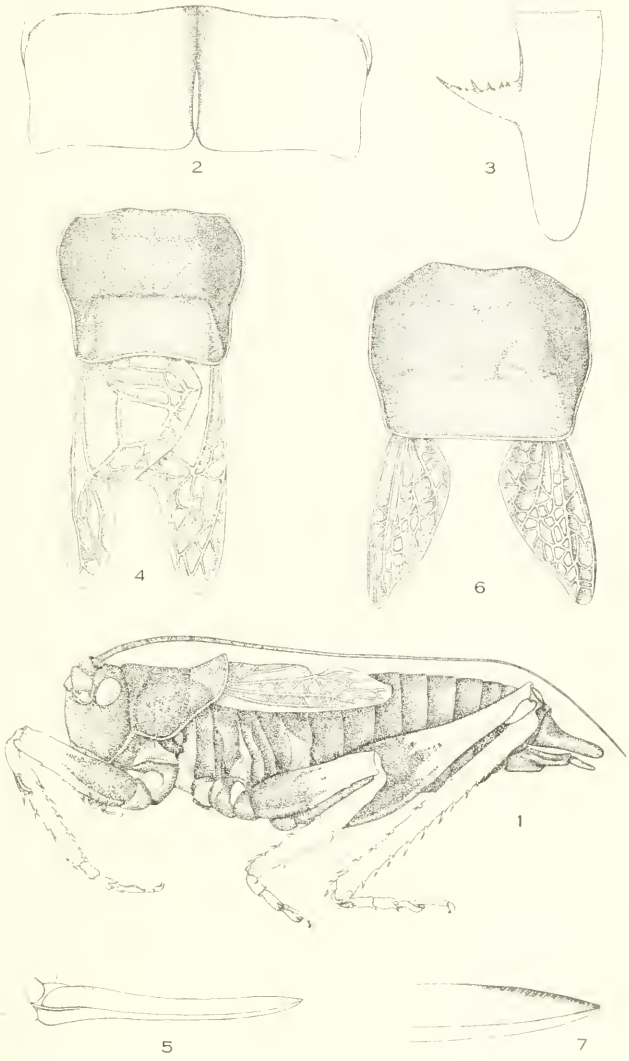

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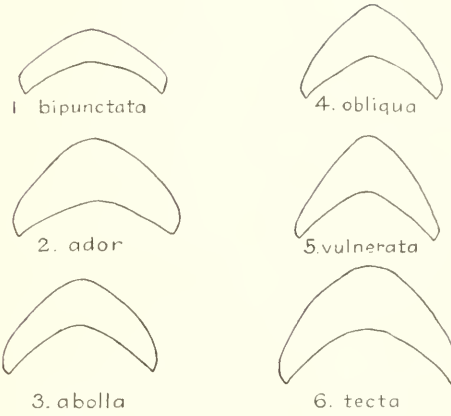

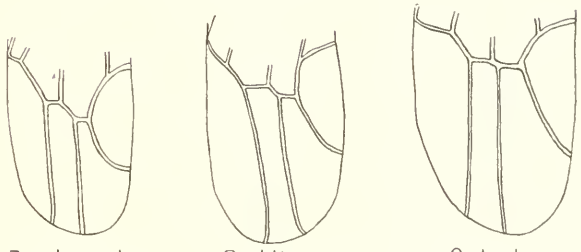

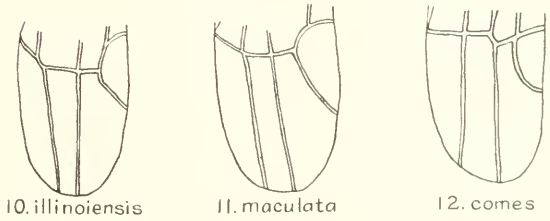

MCATEE—NEARCTIC ERYTHRONEURA (HOMOPTERA)

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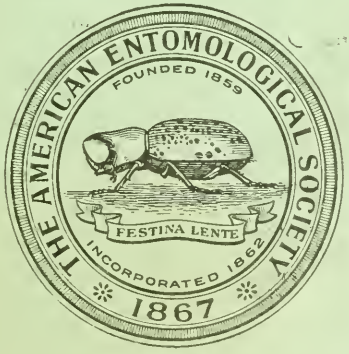

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THE COSTA RICAN SPECIES OF EPIGOMPHUS AND THEIR MUTUAL MATING ADAPTATIONS

(ODONATA)

BY PHILIP P. CALVERT

University of Pennsylvania, Philadelphia, Pa.

(With Plates XIII, XIV and XV)

Abstract

This paper increases the number of Costa Rican species of *Epigomphus* from five to seven and adds data on distribution, colors and structure of all of them.

Adds data on the variation of the generic characters.

Announces a hitherto undetected secondary sexual character in the tarsus of the third leg of the males, which is also a new generic character.

Makes known one hitherto unknown species (*E. subsimilis*) and the previously undescribed female of one other species (*E. tumefactus*).

Attempts a correlation of the form of the heads of the females and the male abdominal appendages as concerned in the act of mating and figures the heads of the females more fully than ever before.

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Historical Introduction

The "sous-genre *Epigomphus* Hagen" was first published by de Selys in 1854 in the *Synopsis des Gomphines*, one of those joint works by the Belgian and the Prussian writers in which it is often

difficult to exactly define the authorship of certain taxonomic groups according to the strict letter of codes of nomenclature. *Epigomphus* was established for a single species, *paludosus* Hagen, from Brazil. To it de Selys added, in 1869, *obtusus* from São Paulo on the upper Amazon and Pebą, and, in 1878, *subobtusus* from the volcano Irazú, Costa Rica, and San Agostino, Guatemala.

In 1903[1] the present writer discussed this genus, adding the new species *llama* from Chulumani in Bolivia, *quadracies* from San Isidro in Guatemala and Chiriqui, Panama, and *tumefactus* from Cachí, Costa Rica, giving a synopsis of the six known species and references to the previous literature. As much of this synopsis and references as concerned the Central American species was reproduced in the *Biologia Centrali-Americana*[2] in 1905, including a previously unknown species, *camelus*, from Carrillo, Costa Rica. Still another species, *verticicornis*, from Tuis, Costa Rica, received as the *Biologia* volume was being completed, found a place on the last page of the text.[3]

In an extensive and important work, *Libellen (Odonata) aus der Region der amerikanischen Kordilleren von Costarica bis Catamarca*[4] Dr. F. Ris has dealt with *Epigomphus*, giving a table of the males of six species in which the new species *armatus* from Finca Hundriesser, Costa Rica, and *hylaeus* from Matto Grosso, Brazil, are included.[5]

The writer's personal collecting in Costa Rica in 1909–10[6] and specimens subsequently gathered in that country by Messrs. C. H. Lankester and D. E. Harrower and sent to him bring the total of Costa Rican species of *Epigomphus* to seven.

[1]Entomological News, XIV, pp. 184, 186–191.

[2]Volume Neuroptera, pp. 169–172.

[3]*T. c.*, p. 410, 1908.

[4]Archiv für Naturgeschichte, 82 Jahrgang 1916, Abteilung A, 9 Heft. Ausgegeben im Juli 1918. Berlin. pp. 1–197. 117 figures in the text and on two double plates.

[5]*T. c.*, pp. 145–154.

[6]See A Year of Costa Rican Natural History by Amelia S. and Philip P. Calvert. New York. The Macmillan Co., 1917.

Distribution of Epigomphus in Costa Rica

The species of *Epigomphus* known to me as occurring in Costa Rica follow. The specimens here recorded for the first time are listed in full; data previously published in the *Biologia* volume and by Dr. Ris are briefly cited. Unless otherwise stated the new material is in the writer's collection and a first set will be placed in the collection of The Academy of Natural Sciences of Philadelphia.

1. E. camelus Calvert

Juan Viñas, 3400 feet (1036 meters), June 24, 1909, one ♂, taken on rock along stream issuing from foot of nearer waterfall;[7] 3900 feet (1188 meters), June 29, 1909, two ♂, at small streams, along the edge of the cañon where sugar cane fields and forest meet, Calvert.

Carrillo, ca. 300 metres (*Biologia*).

2. E. subsimilis new species

Turrúcares, 2200 feet (670 meters), August 14 and 15, 1909, in maize and banana field ("platanal") near left bank of Rio Siquiares, all in the afternoon, three ♂, five ♀ (dry), one ♂, two ♀ (in alcohol), Calvert.

3. E. quadracies Calvert

Rio Chirripo, July 19, 1 ♂; July 25, 1 ♀; July 26, 1 ♂, 1 ♀; all taken in 1915, by D. E. Harrower.

Alajuela, ca. 3200 feet (975 meters), August 4, 1 ♂, 1 ♀; August 8, 2 ♀; all taken in 1915, by D. E. Harrower.

This species, originally described from Guatemala and Panama, has not been recorded previously from Costa Rica. I have also before me a male from Alhajuela, Panama, April 5, 1911, taken by August Busck, in the United States National Museum collection.

4. E. tumefactus Calvert

Estrella, April 13, 1 ♀ and April 19, 1 ♂, both in 1916, taken by C. H. Lankester.

Guapiles, Florida road west of the settlement, in the forest, 980 feet, (300 meters), June 3, 1909, 1 ♂, 1 ♀, in shady places along trail, Calvert; June 4, 1909, 1 ♂ taken by Messrs. Schaus and Barnes.

Guacimo, ca. 650 feet (200 meters), June 6, 1909, 1 ♀, in forest, Calvert.

Peralta, ca. 1050 feet (350 meters), August 7, 1909, 1 ♂, forest by brook; August 8. 1909, 1 ♂, road through woods; Calvert.

[7]Descriptions of localities at which we collected are given in "A Year of Costa Rican Natural History," and in these Transactions, xl, pp. 1–8, 1914.

I have also a female taken by the late Professor P. Biolley, but without precise locality.

Recorded from Cachí, 3280 feet (1000 m.) and Carrillo, ca. 300 m., in the *Biologia*, and by Dr. Ris from Infernillo, Reventazon [= Juan Viñas], 1000 m., 1913.

5. E. verticicornis Calvert

Tuis, 2460 feet (750 meters), June, 1907, 1 ♂, 1 ♀, taken by C. H. Lankester. (These are the type and allotype described in the *Biologia* and now in the collection of The Academy of Natural Sciences of Philadelphia).

In August, 1909, I noted one female of this species from Tuis, taken by Lankester, in the Museo Nacional at San José, Costa Rica.

6. E. subobtusus Selys

Juan Viñas, near the Rio Reventazon, 2500 feet (760 meters), June 28, 1909 1 ♂, 1 ♀, Calvert.

Quebrada Honda, ca. 3450 feet (1050 m.), August 1, 1909, Calvert.

Mountains south of Aguacaliente, ca. 4500 feet (1370 m.), May 20, 1909, 1 ♀, in narrow lane in low woods (second growth, scrub), resting on shrub; Calvert.

Tuis, 2460 feet (750 m.), June 1907, 1 ♂, taken by C. H. Lankester (Acad. Nat. Sci, Phila.).

Recorded from Irazú and Cachí, 3280 feet (1000 m.) in the *Biologia*, and by Dr. Ris from "Tuis, Turrialba 1000 m., 1913; Orosi, Irazu 1500 m. V, 1912."

7. E. armatus Ris

Guapiles, Florida road west of the town, in the forest, June 3, 1909, 1 ♀, Calvert; June 5, 1909, 1 ♀ taken by Messrs. Schaus and Barnes.

Described by Dr. Ris from "Costarica: 2 ♂, 1 ♂ (das ♀ 'Finca Hundriesser')."

Dr. Ris remarks: "Gestalt und Färbung der sehr eigenartigen in dieser Gattung vereinigten Formen lässt in ihnen Waldtiere vermuten und die Herkunft des immerhin noch spärlichen Materials spricht im selben Sinne."[8] My own observations fully bear out this conjecture, although individuals and species may occur in the thin woodlands along water courses, as in *E. subsimilis* at Turrúcares.

From the preceding list of localities it will be seen that five of the seven Costa Rican species have thus far been found only on the moister Atlantic slope of that country with its more extensive forests; one species (*subsimilis*) is at present known only from the Pacific side and one species (*quadracies*) from both slopes. Too much weight must not be laid upon these statements until they have been tested by more thorough collecting.

[8]Archiv f. Naturgesch., 82 Jahrg., Abteil. A, 9 Heft, p. 145. 1918.

As to altitude *tumefactus* has been taken from nearly sea-level up to 1000 meters; *subobtusus* from 750 to 1370 meters; *quadraeies* from near sea-level to 975 meters. Of the other species we have much fewer data.

As to seasonal occurrence it will be noted that all dates of capture of adults fall between April 13 and August 15, that is at the beginning, and in the first half, of the rainy season, although the Atlantic slope of Costa Rica is notoriously wetter throughout the year than the Pacific side. I believe that the absence of dates of collection within the other months has some real significance, since I personally collected at various times in the year at a number of the exact localities in which I took *Epigomphus* and did not find this genus except as recorded above.[9]

Generic Characters of Epigomphus

In 1903[10] I gave figures showing the percentage variation in the generic characters of this genus. Those figures were based on twenty-six individuals, viz: *E. paludosus* 2 ♂; *E. llama* 9 ♂, 5 ♀; *E. quadraeies* 2 ♂, 1 ♀; *E. tumefactus* 2 ♂; *E. subobtusus* 4 ♂, 1 ♀. The present material consisting of forty-six individuals has also been examined for variations in the generic characters, and the data thus obtained have been combined with those of 1903, so that the following results are based on seventy-two individuals, except where otherwise stated. The forty-six specimens of the present material comprise *E. quadraeies* 4 ♂, 5 ♀; *E. tumefactus* 5 ♂ 4 ♀; *E. subobtusus* 5 ♂, 5 ♀; *E. subsimilis* 4 ♂, 7 ♀; *E. armatus* 2 ♀; *E. camelus* 3 ♂; *E. verticicornis* 1 ♂, 1 ♀.

The generic characters are given as nearly as possibly in the same order as that in which they are listed in the *Biologia Centrali-Americana*.[11]

No variations have been found in the following characters:

Internal (subtriangle) and discoidal triangles of the front wings free (*i. e.*, with no cross-veins).

No anal loop on the hind wings.

[9]See my itinerary in Appendix I of "A Year of Costa Rican Natural History," by A. S. and P. P. Calvert, New York, The Macmillan Co., 1917.

[10]Entom. News, xiv, pp. 186–187.

[11]Vol. Neuropt., pp. 146–148.

Third femora reaching but little farther back than the first abdominal segment, armed with spines shorter than the thickness of the femur.

Front wings with M_4 (short sector) and $Cu1$ (first sector of the triangle) divergent, with ten to seventeen marginal cells between them; proximal angle of the discoidal triangle as far (or farther) distad from the arculus as (or than) the length of the proximal side of the internal triangle.

All wings without a brace-vein at the proximal end of the pterostigma.

Arculus of the front wings distal to the second antenodal at least of the subcostal series.

Cubito-anal cross-veins, including the anal crossing (submedian cross-veins), on the front wings two or more.

Males with the abdomen widest at segment ten, except in *E. llama* where segments eight to ten are equally wide; third femora with more numerous shorter spines on the flexor surface than in the female (cf. Plate XIV, figs. 11 and 12); third tibiae and first two joints of third tarsi with the spines of the antero-inferior (outer) row much shorter than those of the postero-inferior row and blunt at tip (cf. Pl XIV, figs. 14, 19); no anal triangle.

Females with the auricles on abdominal segment two, well developed; third tibiae and third tarsi with the two rows of spines similar, slender, acute (*cf*,[12] Pl. XIV, figs. 13, 18).

Variations have been noted in the following characters:

Internal triangle of the hind wings free 99.31 %, with one cross-vein (1 wing) .69 %.

Discoidal triangle of the hind wings free 97.92 %, with one cross-vein (1 wing) .69 %, with two cross-veins (2 wings) 1.39 %.

Supratriangular cross-veins on the front wings absent 92.37 %, one (11 wings) 7.63 %; on the hind wings absent 97.92 % one (3 wings) 2.08 %.

Sectors of the arculus on the front wings separated by an interval less than the thickness of either sector 97.92 %, on the hind wings the same; with no interval between them, *i. e.*, contiguous (two front and two hind wings), 1.39 % each; with interval between them greater than the thickness of either sector (1 front, 1 hind wing) .69 % each.

Basal subcostal cross-veins on the front wings one 97.92 %, two (three wings) 2.08 %;[13] on the hind wings one 96.53 %, two (two wings) 1.39 %, absent (three wings) 2.08 %.

[12]The statements for the third tarsi of males and of females are based on the present material, *E. paludosus* 1 ♂, *E. llama* 4 ♂ 3 ♀. The shorter spines of the antero-inferior row of the tibia and tarsus of *llama* ♂ are suddenly contracted near their tips into acute apices much as shown in Ent. News, XIV. pl. viii. fig. 11 for *subobtusus*.

[13]What may be described as a basal costal cross-vein exists on both front wings of a female of *E. subsimilis;* it is an *un*thickened antenodal proximal to the normal thickened first antenodal, not continuous with any cross-vein in the subcostal space but slightly distal to the level of the normal subcostal cross-vein.

Front wings with one row of cells in the anal space (postcostal cells) from base to level of the discoidal triangle 91.67 %, with two rows (two wings) 1.39 %, with some double cells but not forming two rows (ten wings) 6.94 %; with two rows of cells between *Cu*2 (second or lower sector of the triangle) and the hind margin 86.81 %, with three or more rows (nineteen wings) 13.19 %.

Areulus of the hind wings distal to the second antenodal, at least of the subcostal series, 98.61 %; at or proximal to the second antenodal, etc., (two wings) 1.39 %.

Distal thickened costal antenodal on the front wings the sixth or more remote 96.53 %, the fifth (five wings) 3.47 %; on the hind wings the sixth or more remote 94.45 %, the fifth (eight wings) 5.55 %.

Cubito-anal cross-veins, including the anal crossing, (submedian cross-veins) on the hind wings two or more 97.22 %, one only (four wings) 2.78 %.

Posttriangular rows distad to as far as the level of separation of *M*1+2 and the bridge of *Rs* (principal and subnodal sectors) on the front wings two 95.14 %[14], one (seven wings) 4.86 %; on the hind wings two 99.31 %,[15] one .69 %.

Inferior angle of the ocellar triangle about 90° 95.83 % (or less?), about 100°–105° 4.17 % (or more?).

De Selys first called attention[16] to the difference in the armature of the femora of the two sexes of *Epigomphus:* "les fémurs des mâles ne sont pas épineux, mais simplement denticulés. Chez les femelles les épines sont nombreuses et courtes." The difference is more marked between the *third* femora of the two sexes, as first and second femora of the female approach those of the male.

In 1903[17] the difference in the third tibiae of the two sexes was first published.

In the present paper the further difference in the first and second joints of the third *tarsi* is pointed out and figured. It is curious that it has required forty-seven years to detect these three secondary sexual characters of this pair of legs.

[14]Of the one-hundred and thirty-seven wings making up this item, four (= 2.78 % of the total) have a single cell reaching across the whole width of this area.

[15]Of the one-hundred and forty-three wings making up this item, two (= 1.39 % of the total) have a single cell reaching across the whole width of this area.

[16]Bull. Acad. Roy. Belg. (2) XXXV, p. 755, or Troisièmes Addit. Syn. Gomph. p. 27. 1873.

[17]Entom. News XIV, p. 187.

Mention may be made here also of two abnormalities noted in the wings of the present forty-six individuals: no true pterostigma exists in the left front wing of the female of *E. tumefactus* from Guacimo; an incomplete curved cross-vein exists in the basal cell $R+M$ in the left hind wing of the male of *E. quadracies* from Rio Chirripo, of July 19, 1915.

The genitalia of the second abdominal segment of the male of *E. subsimilis* are shown in Pl. XIII, fig. 4. I have expanded these organs in *subobtusus* 1 ♂, *tumefactus* 2 ♂, *quadracies* 1 ♂, *verticicornis* 1 ♂, and *camelus* 1 ♂, and compared them with those of *subsimilis* and have found no differences other than in the size of the first hamule. The form of these organs, therefore, may be considered as a generic character.

There is little difference also in the vulvar laminae of the females as they resemble that of *E. llama* of Bolivia[18], but with the interval between the lobes triangular rather than quadrangular. Taking the six Costa Rican species of which I have females, the apices of the lobes reach to from .4 to .65 of the length of the lateral margin of abdominal segment nine, and the lamina is bifid in the distal .4 to .62 of its length. Details are given *pos ea* under each species, but I believe that the range of variation in these dimensions is partly, perhaps largely, due to differences in the drying of specimens.

Dr. Ris, after describing the structure of the posterior abdominal segments of the female of *E. obtusus* from Peru as typical of the genus, adds: "Die sehr eigenartige Bildung erweckt die Vermutung, dass die Eier in engen Spalten abgelegt werden (vielleicht Zwischen die Blätterbasen der Bromeliaceen, wie bei *Mecistogaster?*)."[19] On looking through my field notes made in Costa Rica the only reference to oviposition of *Epigomphus* which I find is in connection with *E. subsimilis* at Turrúcares, on August 14, 1909, and is as follows: "*Epigomphus* oviposits unaccompanied by ♂; its eyes deep blue above in life." In the absence of mention of any peculiar ovipositing habit, I infer that *Epigomphus* then and there dropped her eggs in water as most North American Gomphines do. I can not recall any details of the observation to which this note refers.

From two females of *E. subsimilis* at Turrúcares eggs were obtained and from them larvae were reared through at least

[18]See fig. 3, pl. viii, Ent. News, xiv.

[19]Archiv f. Naturges., 82 Jahrg., Abteil A, 9 Heft, p. 153.

two instars. These larvae are reserved for treatment in another paper to deal with immature stages of various Odonata.

Synopsis of the Species and Notes on their Colors, Vulvar Laminae, etc.

In my paper of 1903 and again in the *Biologia* volume (1905), I gave synopses of species of *Epigomphus* arranged in the form of keys for identification. The primary division of both these synopses was based on the second pale antehumeral stripe, since this is a character common to both sexes. Males and females were then treated separately under each of these two primary divisions, fewer species being known in the female sex than by males.

Dr. Ris has also given a "Tabelle der ♂" grouped primarily on the form of the inferior appendage, the second pale antehumeral stripe being assigned a secondary position.

In view of the existence of these three keys it seems unnecessary to give one here for the males, although the males of *verticicornis* and, of course, of the new species here described (*subsimilis*) are not included in any one of them. The description of the male of *verticicornis*[20] is so drawn up that the differences from other species can readily be seen by comparison with the synopsis in the same work, and the description of *subsimilis* herewith presented follows the same plan. It appears worth while to attempt a key for the females of this genus, since I know them in a greater number of species than in 1905, and since a character of which I then made some use (the spines of the third femora) appears to be too variable to serve as a specific differential.[21]

It should be pointed out here that what I call the "occiput" corresponds to what Dr. Ris calls the "occipital platte," and that what he names the "hintern Flache des Occiput" is the rear of the head in my nomenclature, as I incline to the view that this area is post-genal rather than occipital.

[20]Biol. Cent.-Amer., Neur., p. 410, 1908.

[21]*Cf.* the description of the female of *verticicornis*, *loc. cit.*

Key to the Females of Costa Rican Epigomphus

I. One pale green or yellow antehumeral stripe and a more posterior pale green or yellow antehumeral spot, the latter representing the upper end of the second antehumeral stripe of §II.

Behind each lateral ocellus no tubercle projecting markedly above the level of the ocellus itself.

Vertex without five longitudinal grooves, occiput without a strong postero-superior tubercle at each lateral extremity.

In dorsal view each lateral ocellus subequally distant from the mid-dorsal line of the head and from the adjacent eye-margin.

subsimilis, new species

In dorsal view each lateral ocellus two to four times as far from the mid-dorsal line of the head as from the adjacent eye-margin.

quadracies

Vertex with five longitudinal grooves, one median, two lateral ocellar and two paroecular; occiput with a strong posterior or postero-superior tubercle, or rounded horn, at each lateral extremity.

tumefactus

Behind each lateral ocellus a stout tubercle projecting much above the level of the ocellus itself. (Differs from *armatus* also in having no such deep pits on the rear of the head. Cf. figs. 25, 26, 29, 30, pl. XV) . . . . . **verticicornis**

II. Two narrow pale green or yellow antehumeral stripes, the posterior one close to the humeral suture.

Behind each lateral ocellus no tubercle projecting dorsad markedly above the level of the ocellus itself . . . . . **subobtusus**

Behind each lateral ocellus a stout tubercle which projects dorsad markedly above the level of the ocellus itself. Rear of the head with a much deeper pit each side than in the preceding species.

armatus

The female of *E. camelus* is still unknown.

The structure of the head of the females is described under the section of this paper entitled "Mutual Mating Adaptations," pages 338–352. It is, therefore, omitted from the following notes on some of the species.

Epigomphus camelus

Epigomphus camelus Calvert, Biol. Cent-Amer., Neur., pp. 170, 172, tab. viii. figs. 1–3 (apps. ♂), 1905.

The following is based on the three males listed *antea*, page 325.

♂. Pale color (blue?) on the dorsal surface of the frons separated into two spots, right and left, by a narrow median blackish stripe.

Metepimeron with a dark brown stripe along its ventral margin, parallel to the brown stripe on the second lateral suture and at mid-length wider than the pale yellow which separates it therefrom.

Abdominal segment two with a narrow, mid-dorsal, longitudinal, yellow stripe reaching caudad to the transverse anteapical row of denticles and bordered on each side with brown; three with a mid-dorsal, longitudinal, yellow line which is not confluent with yellow on each side of the segment, which lateral yellow extends for almost the entire length thereof; four to six with a mid-dorsal, basal, yellow spot, occupying the basal fourth on four, less on six, not confluent with yellow on the sides in the basal third of each segment; seven yellowish in its anterior half or slightly more, except for a transverse brown stripe at one-third of the segment's length, remainder blackish brown; eight to ten blackish brown with indefinite yellowish or reddish-yellow markings on the sides.

Vertex similar to that of *subsimilis* ♂, occiput with two prominent transversely elongated convexities which occupy almost its entire dorsal surface, no dorsal pits or posterior tubercles; rear of the head undifferentiated.

Abdomen 37 to 40 mm.; hind wing 34 to 36 mm.

Epigomphus subsimilis new species (Pl. XIII, figs. 1 to 7.)

♂. Abdominal segment eight distinctly wider at its posterior end (2.5 to 2.8 mm.) than at its anterior end (1.1 to 1.6 mm.), nine subequal in width to the hind end of eight, but widening slightly caudad, ten a little wider (2.8–3.2 mm.) than the hind end of nine and distinctly higher (2.7–2.9 mm. *vs.* 1.75–2.1 mm.), its dorsal surface convex when viewed from behind but without a tubercle, having two dorsal groups, one right and one left, of two to eight spinules and on each lateral surface a group of similar more numerous spinules.

Superior appendages 1.25–1.5 mm. long, shorter than nine, each one, in dorsal view, having the inner (mesal) edge slightly concave, the outer (lateral) edge almost straight, the two edges distinctly divergent from base to apex, apex truncate a little obliquely mesad and caudad, the inner (mesal) angle the more acute: in profile, the upper and lower edges convergent, the upper edge longer and slightly convex, the lower slightly concave, the lateral apical angle of the dorsal view not projecting below the lower edge (when the appendages are *not* spread apart, as is usually the case in specimens which have not been prepared in the way that the original of our fig. 2 has been) but the mesal apical angle produced ventrad below this edge as a moderately curved subacute process.

Inferior appendage a little longer than the lower edge of the superiors, hence projecting a short distance beyond the latter, bifid in its distal half, the apices of the two branches less distant than the apices of the superiors; in profile the tip of each branch is shallowly bifid the upper division stouter, more rounded, recurved, the lower a little longer and directed caudad and slightly dorsad. Dorsal surface of the appendage concave, mesal margins of its two branches elevated and with a conical tooth at the proximal sixth; right and left margins of the whole appendage diverging slightly, the distance between the tips of its branches (1.4 to 1.5 mm.) greater than the width (.7 mm.) of either branch at base, opposite (*i. e.*, mesal) edges of the two branches diverging strongly throughout.

Each lateral ocellus on the summit of an elevation a little nearer to the mesal margin of the adjoining eye (.21 to .28 mm.) than to the mid-dorsal line of the head (.35 to .42 mm.). Meso-caudad of each ocellus and on the elevation is a ridge or wall, subparallel to the ocellar margin, which rises almost, but not quite, as high as the ocellus itself, its crest rounded, the ridges of the right and left sides connected on the mid-dorsal line so that in dorsal view they present the appearance of an inverted W, the angles of which are rounded in some specimens; there is some tendency to prolong this ridge on the lateral side of the elevation, as in *subobtusus*, but it is not as strongly manifested as in that species where the ocellar elevations are lower. Elevations of the right and left ocelli separated by a depression which, in posterior view, is about as deep as one-half of the height of either elevation.

♀. Vertex similar to that of the ♂, the distance of the lateral ocelli from the mid-dorsal line of the head a little greater (.49 mm.) in some, the depression between the two elevations deeper in some.

Vulvar lamina .77 to .84 mm.[22] long, reaching to half of the length of the lateral margin of segment nine, bilobed in the apical .46 (average of 7 ♀, range .42–.58, cf. page 330, *antea*) of its length, interval between the lobes triangular.

♂ and ♀. Pale color on the dorsal surface of the frons separated into right and left spots.

Metepimeron with a dark brown band on or near its ventral margin, parallel to, but separated from, the brown band, of the second lateral suture by pale green or yellow of more than its own width; absent in the two alcoholic females (otherwise well preserved as to color) and indistinct in some of the dry specimens of the same sex.

Abdominal segment two with a mid-dorsal, longitudinal, yellow stripe for more than half the segment's length, reaching or not reaching the extremities of the segment, bordered on each side by brown; three to six chiefly ochraceous, blackish brown in the apical fourth, less defined in the ♀; seven paler, green or yellow, in the anterior three-fifths, blackish brown in the remainder; eight to ten blackish brown, sides yellowish inferiorly in the ♂, indistinctly so on eight in the ♀.

Abdomen, ♂, 38 to 41, ♀ 42 to 46; hind wing, ♂, 34 to 35, ♀, 37 to 40 mm.

Type.—♂; Turrúcares, Costa Rica, August 14, 1909, taken by P. P. Calvert. *Allotype.*—♀; same locality, date and collector. Paratopotypes.—3 ♂, 6 ♀; all as listed *antea*, page 325.

The specific name proposed alludes to the greater degree of resemblance in the vertex and occiput of the two sexes than prevails in the other Costa Rican species here treated.

[22]The measurements here and elsewhere in this paper for the vulvar laminae are made by eye-piece micrometer with a Zeiss binocular microscope, paired oculars 4, objectives F 55.

Epigomphus quadracies

Epigomphus quadracies Calvert, Ent. News, XIV, pp. 188, 189, 190, 191. 1903. Biol. Cent.-Amer., Neur., pp. 170, 171, 172, tab. vii, fig. 36 (occiput ♀), tab. viii, figs. 4,5 (apps. ♂). 1905. Ris, Archiv. f. Naturgesch., 82 Jahrg., Abteil A, 9 Heft, p. 150. 1918.

The following notes are based on the material listed *antea*, page 325:

Pale color on the dorsal surface of the frons separated into two spots, right and left, in all except the male of August 4. No dark band on or near the ventral margin of the metepimeron.

Abdominal segment two with a mid-dorsal, longitudinal, yellow stripe which reaches the hind end and is bordered on each side by blackish brown (♂), more indistinct and bordered by brown or ochraceous in the ♀; three to six blackish brown with a mid-dorsal yellow or ochraceous line, or this line on three and four only, five and six with a small, mid-dorsal, basal yellow spot (Panama ♂); three with a longitudinal, lateral, yellow stripe on its anterior five-sixths, four to six with a basal, lateral, yellow spot; seven with anterior half to three-fifths (♂) or third (♀) ochraceous, pale green or yellow, remainder blackish brown or brown; eight to ten blackish brown, the males with a variable extent of yellowish inferiorly on the sides.

♀. Vulvar lamina .63–.7 mm. long, reaching to .4–.5 of the lateral margin of segment 9, bilobed in its distal .4–.5, interval between the lobes triangular.

Abdomen, ♂, 35 (Alajuela), 39 to 39.5 (Rio Chirripo); ♀, 40 to 42 (both localities); hind wing, ♂, 30 (Alajuela), 32 (Rio Chirripo); ♀, 34.5 to 35 mm. (both localities).

Epigomphus tumefactus

Epigomphus tumefactus Calvert, Ent. News, XIV, pp. 188, 190, 191, pl. viii, fig. 4 (entire ♂). 1903. Biol. Cent.-Amer., Neur., pp. 171, 172, tab. viii, figs. 6, 7 (apps. ♂). 1905. Ris, Archiv f. Naturgesch., 82 Jahrg., Abteil A, 9. Heft., pp. 146, 147, 149, figs. 94, 95 (apps. ♂). 1918.

The following notes are based on the material listed *antea*, page 325:

Pale color on the dorsal surface of the frons narrowly (♂) or widely (♀) separated into two spots, right and left.

Metepimeron with a brown band on or near its ventral margin in the males from Peralta and Guapiles, faint in the Estrella ♂ and Guacimo ♀, absent in the other three females.

Abdominal segment two with a yellowish, longitudinal, mid-dorsal stripe bordered on each side by brown; three to six blackish, three (or three and four, ♀) with a mid-dorsal, longitudinal, yellow line, four to six with a mid-dorsal, basal, yellow spot; three with yellow on the sides for the anterior three-fourths, not confluent with the dorsal yellow; four with yellow on the sides for the basal third to almost the entire length, usually not confluent with the dorsal yellow; five to six yellow on the sides for the basal sixth to two-thirds, usually not confluent with the dorsal yellow; seven with the basal four-to five-sevenths (♂), two- to three-sevenths (♀) yellow, except for a transverse brown line each side at two-sevenths of the segment's length,

the remainder of the segment brown; eight to ten blackish brown with a variable extent of yellow on the sides inferiorly.

♀. Vulvar lamina .91 to .98 mm. long, reaching to .44 to .54 of the length of the lateral margin of segment nine, bilobed in the distal .54 to .58 of its length, interval between the lobes triangular.

Abdomen, ♂, 40 to 42, ♀, 44 to 47; hind wing, ♂, 34.5 to 36, ♀, 38 to 39 mm.

Epigomphus verticicornis

Epigomphus verticicornis Calvert, Biol. Cent.-Amer., Neur., p. 410. 1908.

The following notes are based on the type ♂ and allotype ♀ listed *antea*, page 326:

Pale color on the dorsal surface of the frons narrowly (♂) or widely (♀) separated into two spots, right and left.

Metepimeron with a brown stripe near the ventral margin, but not reaching the entire length of the sclerite, parallel to, but separated from, the brown stripe on the second lateral suture by pale green of more than its own width.

Abdominal segment two faded in the ♂, with a narrow, mid-dorsal, yellow stripe reaching to the transverse anteapical denticles and bordered with brown on each side (♀); three to four with a mid-dorsal, longitudinal, yellow line and yellowish laterally for much of their length, confluent in the ♀ with the dorsal yellow at the base of three but not on four; five and six faded in the ♂, in the ♀ with a small, basal, mid-dorsal, yellow spot and the sides yellow in the basal third, not confluent with the dorsal yellow; seven faded, yellowish on the anterior five-sixths (♂) or half (or more? ♀), blackish in the remainder; eight to ten blackish with ill-defined yellowish or reddish-yellow on the sides (♂, but not ♀).

Epigomphus subobtusus

Epigomphus subobtusus Selys, Bull. Acad. Roy. Belg. (2), XLVI, p. 467, 1878. Quatriémes Addit. Syn. Gomph, p. 62, 1878. Calvert, Ent. News. XIV, pp. 189, 190, 191, pl. viii. figs. 10, 11 (3rd tibia ♂), 1903; Biol. Cent.-Amer., Neur., pp. 171, 172, 399, tab. vii, fig. 37 (occiput ♀), tab. viii, figs. 8, 9 (apps. ♂), 1905, 1907; A Year of Costa Rican Nat. Hist., pp. 149, 207, 1917. Ris, Archiv f. Naturgesch., 82 Jahrg., Abteil A, 9 Heft, pp. 146, 147, 150, 1918. Calvert, Ent. News, XXX, p. 36, 1919.

In the book of 1917 above cited we have referred to the case of mimicry observed at Quebrada Honda, Costa Rica, between this species and *Brechmorhoga rapax crocosema*. Following is a fuller statement of the observation from my field note book.

On August 1, 1909, at a small stream, descending from woods high above the railroad tracks by a series of cascades through steep fields of garlic (or onions), beets, manihot, etc., and passing under the tracks west of the bridge over the Quebrada Honda

the following Odonata were observed: *Brechmorhoga rapax crocosema* Ris, *Epigomphus subobtusus* Selys, *Paltothemis lineatipes* Karsch, *Hetaerina cruentata* Ramb., *Argia extranea* Hagen and *Cora chirripa* Calvert. A marked similarity in color and manner of flight between the *Brechmorhoga* and the *Epigomphus* was noted. They were found at the same spot in the stream. The resemblances observed were:

The approximately equal length of body, the abdomen widest at or near its hind end, the blue (*Epigomphus*) or bluish-green (*Brechmorhoga*) eyes, the thoracic pattern—dark brown with pale oblique bluish or greenish stripes, the abdomen dark brown with bluish (*Epigomphus*) or greenish (*Brechmorhoga*) longitudinal markings at the bases of segments three to five or six, the seventh segment with a more conspicuous pale marking than on any other part of the body.

The differences other than those of taxonomic value are:

The more robust form and wider wings of *Brechmorhoga*, the widening of the abdomen on segments eight to ten in *Epigomphus*, on six to seven in *Brechmorhoga;* the metallic green of the frons of *Brechmorhoga*, pale blue in *Epigomphus*, the wider pale stripes on the thorax of *Brechmorhoga*, the pale mark of abdominal segment seven in *Brechmorhoga* deep yellow, in *Epigomphus* pale blue.

While the manner of flight is similar, *Brechmorhoga* stays longer on the wing and poises longer in the air, while *Epigomphus* tends to alight more frequently. *E. subobtusus* and other species of its genus curl the hind end of the abdomen ventrad very often when flying about.

When referring to these observations in 1917 we pointed out that: "There was nothing in this case, however, to suggest that the resemblance offered a means of defense to either species against enemies."

The following notes are based on the material listed *antea*, page 326, and on two males three females from Cayuga, Guatemala, April 25, May 3, 8 and 28 taken by Messrs. Schaus and Barnes, included in the paper of 1919.

Pale color of the dorsal surface of the frons not separated into two spots right and left in all five males and the Juan Viñas female; so separated in three females, that of April 25 being uncertain.

Metepimeron with a brown stripe as described for *E. subsimilis*, not reaching the whole length of the sclerite.

Abdominal segment two with a longitudinal, mid-dorsal, yellowish[23] stripe

[23]Color as seen in the dried specimens. Compare the statements given above for the living colors.

bordered on each side with brown; three to six dark brown, with a mid-dorsal, longitudinal, pale line, or on three and four only, five and six with a small basal spot; three with a yellowish stripe each side from base almost to apex; four to six with a yellowish spot or stripe each side occupying the anterior fourth to seven-ninths on four, fourth to five-sixths (but then less distinct) on five, fourth to third on six; seven yellowish in its anterior three-fifths to four-fifths, except for a transverse brown line each side at one-third of the segment's length, the remainder brown; eight to ten dark brown with indistinct yellowish markings on each side inferiorly for the entire length of these segments.

♀. Vulvar lamina .84 to .91 mm. long, reaching to .4 to .65 of the length of the lateral margin of segment nine, bilobed in the distal .5 to .62 of its own length, interval between the lobes triangular.

Epigomphus armatus

Epigomphus armatus Ris, Archiv f. Naturgesch., 82 Jahrg., Abteil A, 9, Heft, pp. 146, 147, 148, figs. 90 (thor. pattern), 91–93 (apps. ♂), 1918.

The following notes are based on the material listed *antea*, page 326:

♀. Pale color on the dorsal surface of the frons widely separated as two spots, right and left.

Metepimeron apparently with no dark stripe near its ventral margin (none shown in Dr. Ris' figure 90).

Abdominal segment two faded, apparently with a broad, basal, dorsal, yellowish area contracted on the posterior half of the segment to a narrow, longitudinal stripe, stripe bordered each side with brown; three to six with a mid-dorsal, longitudinal, yellow line apparently confluent at base with yellow which extends the entire length of the sides but is crossed by a transverse blackish line at one-third the length of each segment; seven yellowish, only a similar transverse stripe and the hindmost sixth of the segment blackish eight to ten blackish, yellowish on the sides inferiorly for most of the length of eight and indistinctly on nine.

♀. Vulvar lamina .77 to .84 mm. long, reaching to .57 to .59 of the length of the lateral margin of segment nine, bilobed in the distal .45 to .5 of its length, lobes more nearly parallel than in the other species, but this may be due to individual or mechanical conditions of the specimens.

Mutual Mating Adaptations

Soon after making my collection of Odonata in Costa Rica I noticed the modifications which the specimens of *Epigomphus* presented and made this note for my future guidance: "A comparative study of the shapes of the apps. ♂ and the vertex, occiput and rear of head ♀ ought to give some interesting sexual co-adaptations." In 1910, Dr. F. Ris interpreted [24] the presence of certain scars on the compound eyes of females of *Anax*

[24] Kopulationsmarken bei Libellen. Deutsche Entom. National-Bibliothek, 1, pp. 70–80.

parthenope as due to the teeth on the inferior appendage of the male, applied against the dorsal surface of her head when pairing. These scars (which I also have found in females of *A. junius*, *A. parthenope* and *A. imperator*) are, he noted, accompanied in some cases with a coagulated crust which, he suggested, might be derived from a secretion of the male, or exuded blood or lymph of the female. Dr. E. M. Walker has described and figured[25] the copulatory position of the male appendages of *Gomphus spicatus*, in which they are represented as being stretched apart rather widely, and I have made some suggestions as to the probabilities in *Erpetogomphus tristani*.[26] Dr. C. H. Kennedy has figured and briefly described[27] the manner in which the appendages of the male of the Californian *Octogomphus specularis* clasp the head of the female. In describing *Epigomphus armatus*, Dr. Ris remarks: "Die Struktur des ♀ Occiput ist ein sehr schönes Beispiel von Anpassung des ♀ an die Klammerfunktion des ♂ Appendices,"[28] although he does not point out the adaptations in detail.

Availing myself of these observations and suggestions, I have attempted, in the following pages, to correlate definitely the structures of the two sexes when in the copulatory position. I hope that other students may be able to correct or improve upon what is here offered. *Epigomphus verticicornis* is considered first because the evidence seems fullest for that species.

Epigomphus verticicornis (Pl. XV, figs. 23 to 26.)

Of *Epigomphus verticicornis* I have only two specimens, the type male and allotype female from Tuis, taken by Mr. C. H. Lankester, which, as stated in the *Biologia* volume, p. 410, "communicated by Prof. Biolley, were taken in June, 1907, and sent enclosed in the same envelope, whence it is concluded they were pairing."

This female has on the rear of the head behind the right eye, at about the same horizontal level as the mesal angulation of

[25]The North American Dragonflies of the genus Aeshna. University of Toronto Studies, Biological Series No. 11. pp. 41–42, pl. 2, fig 7, 1912.

[26]Ent. News, XXIII, pp. 294–295, 1912.

[27]Proc. U. S. Nat. Mus., 52, p. 578, figs. 332, 333, and p. 579, 1917.

[28]Archiv f. Naturgesch., 82 Jahrg., Abteil. A, 9 Heft, p. 149, 1918.

the posterior eye margin, a group of three contiguous scars or depressions (Pl. XV, fig. 26, *pgc*) and in the corresponding position behind the left eye two groups of two scars each. The distance beyond the right and left groups is very nearly equal to the distance between the apices of the right and left superior appendages of the male, when these are spread apart as in Pl. XV, fig. 24, *pgc'*. It seems highly probable, therefore, that when pairing the apices of the superior appendages of the male were applied against the hind surface of the female's head at the positions now indicated by the scars, the scars being produced by the tooth at the apex of each appendage. The fact that there is more than one scar on each side of the female's head may be readily accounted for by supposing that a permanent hold was not immediately secured, and that some slight shifting of the male's appendages occurred in the attempt, or that two or more males may have paired with this female, as Dr. R. T. Hance suggests.

These *post-genal* scars, or *cicatrices*, as they may be termed, lie in a wide and shallow groove which extends from its upper end obliquely ventrad and mesad. This groove is bounded superiorly by a transverse ridge whose summit is rounded off; above this ridge are nine or ten subvertical impressed lines (Pl. XV, figs. 25, 26, *ll*) such as are found in corresponding positions on the female of *E. tumefactus* (Pl. XIV, fig. 22, *ll*). Two possibilities are suggested by the existence of these impressed lines: (1) that they may serve as guides to direct the apices of the male's superior appendages when he is attempting to grasp the female's head, and hence must exist before pairing, or (2) that they are produced by the tooth on the tip of those appendages when he makes that attempt and that in consequence they also are cicatricial. Against this latter view is the circumstance that the area over which they are found is much wider than the area covered by the above-described post-genal cicatrices, whereas one would expect approximately as many cicatrices as impressed lines. It should be noted that the distribution of these impressed lines is not exactly symmetrical on the two sides of the head.

A slight linear depression (Pl. XV, fig. 26, *x*) mesad to the lower end of the most mesal of these impressed lines may possibly

receive (or be caused by ?) the "downwardly-directed spine"[29] of the inner surface of the left superior appendage of the male (Pl. XV, fig. 23, *x'*); this slight depression is present also, but less marked, on the right side of the head, although this spine is absent on the right superior appendage of the single male; perhaps its presence on the right side of the female's head is confirmatory of Dr. Hance's suggestion and this female may have paired also with a male which had this spine present on both superior appendages.

On the dorsal surface of the head of this female certain scars are visible. The best marked are a group of two (right) or three (left) near the mesal margin of the facetted portion of the compound eyes, at the same transverse level as the horns behind the lateral ocelli ("vertex tubercles"). Between each group and the nearer lateral ocellus another scar is visible in a groove on the vertex, the *parocular sulcus* (*prs*), close to and paralleling the eye margin. Parocular scar and eye scars together constitute a group of *superior ocular cicatrices* (Pl. XV, fig. 25, *soc*). The distance from the right group of these *cicatrices* to the left group corresponds very closely to the distance between the apices of the two branches of the inferior appendage of the male (Pl. XV, fig. 24, *soc'*) and the cicatrices are doubtless produced by the two teeth on each side of these apices. There is what seems to be a scar posterior to each "vertex tubercle," between it and the occipital tubercle of the same side of the head, but I am unable to correlate these scars with any projection on the dorsal surface of the male's inferior appendage, as the "fairly slender forwardly-curved spine" thereof (Pl. XV, figs. 23, 24 *y*) is situated at a greater distance from the apices of the inferior appendage than exists between these scars and the superior ocular cicatrices of the same side of the head. It seems more likely that these spines of the male come in contact with the occiput, but I find nothing there of such a shape as would engage these spines. The wide, concave, distal margin of the inferior appendage of the male is doubtless applied against the posterior surfaces of her two postocellar or vertex tubercles (*poct*), while her occipital tubercles (*dot*) are

[29]The words enclosed in quotation marks are from the original description in Biol. Cent.-Amer., Neur., p. 410.

probably received into two shallow depressions (*dot'*) of his appendage which lie immediately distad and slightly mesad of his forwardly-curved spines, the latter, therefore, apparently lying just laterad of the occipital tubercles when pairing, perhaps in the parocular grooves.

The extent to which the head of the female of this species has been modified in apparent correlation with mating may be seen from the following details of the structure of the head of the male.

The vertex of the male and that of the female are dissimilar, the former being like that of *quadracies* male (except that the lateral ocelli are not so near to the eye margins) and of both sexes of *subsimilis*, and lacks the conspicuous postocellar, or "vertex, tubercles" of the female.

The occiput of the two sexes is dissimilar in that the male has shallow pits dorsally where the female has tubercles and the posterior surface smoother and less swollen.

The rear of the head (postgenae) of the male has no transverse rounded ridge and but very few traces of the subvertical impressed lines of the female.

Epigomphus armatus (Pl. XV, figs. 27–30.)

Of this species, recently described by Dr. Ris, I have two females but no males. He has figured the appendages of the male and I copy two of his figures; in the specimen from which figure 27 was made the superior appendages were apparently not as widely distended as they are in the act of pairing. The apices (*p'*) of the male's superior appendages are, doubtless, received into the very deep pits (Pl. XV, fig. 30, *p*) of the rear of her head. One of my females has distinct superior ocular cicatrices near the angle of the mesal margin of the eyes. By analogy with *E. verticicornis*, I would expect that the apical (distal) margin of the male's inferior appendage would, when pairing, be applied against the posterior surfaces of the two postocellar, or vertex, tubercles ("kräftige hornartige Fortsätze" of Dr. Ris) of the female. A comparison of fig. 27 with fig. 29 shows, however, that if the apices (*soc'*) of his inferior appendage cause the cicatrices, *soc*, the shape of the distal margin of the appendage is such that it would then lie some distance away from and caudad to the post-ocellar tubercles.

In the absence of male specimens I am unable to make any further suggestions.

Dr. Ris has described the vertex of *armatus* male which lacks the postocellar tubercles.[30]

Epigomphus tumefactus (Pl. XIV, figs. 20 to 22.)

On the dorsal surface of the head of the female there is a distinct *parocular groove* (*prs*) along the mesal margin of each eye from the antenna almost to the occiput; it is deepest at its posterior end. Between the right and left parocular grooves are three other longitudinal grooves each delimited laterad by distinct longitudinal ridges. The median of these may be called the *median vertex groove* or *sulcus* (*mvs*) and extends from the frons almost to the occiput; it is wider anteriorly, where it lodges the median ocellus, narrows to its mid-length, thence widens slightly to its posterior end. The other two grooves may be styled *paramedian* or *lateral ocellar sulci* (*los*) and extend almost from the hind margin of the frons almost to the occiput; the ocellus in each groove is situated on the mesal slope thereof. All five grooves are barred from reaching the occiput by a low transverse, posterior, terminal ridge of the vertex (Pl. XIV, fig. 21, *tr*) reaching from eye to eye.

The female from the Florida Road, of June 3, has a marked superior ocular cicatrix on the right eye at its mesal margin opposite to the ocellus of the same side, a scar which extends into the right parocular groove. In the corresponding part of the left parocular groove there are three or four slight impressions, close together, which may be cicatrices, but there is nothing of the kind on the left eye.

The occiput has a pair of low transversely elongated tubercles or low ridges (fig. 21, *dor*) in the middle two-fourths of its dorsal surface, its hind margin is distinctly and narrowly emarginated in the middle and there is a strong tubercle with blunt, rounded apex (*pot*) on the posterior surface laterad to the level of the mesal angle of the dorso-mesal margin of each compound eye.

On each side of the rear of the head, at about one-third of the distance from the lateral end of the occiput to the outer surface of the eye is a subvertical ridge (fig. 22, *r*), on the mesal side of which is a pit (*p*, same figure) and on the lateral side a distinct subvertical groove (*g*). From the pit and a wide shallow trough running from it mesad and ventrad extend mesad and dorsad

[30]Archiv f. Naturgesch., 82 Jahrg., Abteil. A, 9 Heft, p. 147.

about eleven impressed lines (*ll*), some of them subparallel to their next neighbors, others diverging; the more dorsal of these are nearer together.

No post genal cicatrices are visible on this female. That of June 6 shows what may be faint scars but these are asymmetrically placed. The female taken by Biolley presents two pairs of approximately bilaterally symmetrical scars, and these have been added to figure 22, *pgc*. The female from Estrella shows no cicatrices, the pit, ridge and groove on each side of the rear of the head are much less pronounced than in the other three females.

The following suggestions as to the relations of the male appendages to the female head, when pairing, seem plausible: That the lateral apical angles (Pl. XIV, fig. 20, *p'*) of his superior appendages are received by the pits *p* (fig. 22), the mesal apical angle and the denticles of the inferior apical margin (*ll'*) fit into some of the impressed lines *ll;* distended still more widely the mesal apical angles may produce the postgenal scars (*pgc*); each strong posterior tubercle, *pot*, of her occiput is received within the concave mesal surface (*pot'*) near the base of his superior appendage of the same side of his body; the apices (*prs'*) of his inferior appendage are placed in her parocular grooves (*prs*), while the transverse dorsal ridges (*dor*) of her occiput are lodged in the concavity (*dor'*) of the dorsal surface of the undivided basal portion of his same appendages; perhaps the dorsal denticles near the apical margin of this latter (Pl. XIV, fig. 20, *d*) may secure some hold on the longitudinal ridges which separate the five vertex grooves of her head.

In the vertex of the male the parocular sulci are present but narrower, the median sulcus is shallower and less sharply defined, the lateral ocellar sulci are much shorter antero-posteriorly as the vertex rises cephalad from its hind margin to an elevation immediately caudad to, and of about the height of, each ocellus, the two elevations thus formed being separated from each other by the median sulcus; the lateral ocellar sulci likewise are much less sharply defined from adjoining sulci than in the female.

The occiput of the male lacks the pair of low transverse dorsal ridges, its hind margin is less emarginated in the middle and the lateral posterior tubercles are much shorter and less pronounced.

On the rear of the male's head, the homologue of the subvertical ridge of the female can be recognized in a similar but more rounded swelling, but pit, groove and impressed lines, as described for her, are absent.

Epigomphus quadracies (Pl. XIII, figs. 8 to 10.)

Of the five females of this species, two show superior ocular cicatrices near the mesal angle of the mesal margin of each eye. One of these (July 25) has each cicatrix (fig. 9, *soc*) consisting of two adjacent impressions in the facetted portion of the eye, accompanied by only a very slight exudation, but otherwise shows no difference in color from adjoining areas of the eye; there is a slight depression on the hind surface of the elevation on which each lateral ocellus is situated; the dorsal surface of the occiput has a pit, (*dof*) occupying each of its lateral thirds, the external (lateral) wall of which is creased and grooved transversely; there is a small, conical, supero-posterior tubercle (*pot*) at each lateral extremity of the occiput; on the rear of the head, behind each eye, at the level of not quite half-way from the mesal angle of the superior surface of the eye to its extreme lateral margin, is a fairly deep pit (fig. 10, *p*), elongated slightly obliquely from above mesad and ventrad; this pit is not as deep as in the female of *armatus*, but is deeper than in any other of the Costa Rican species here considered; as in *armatus*, this pit is bounded mesad by a prominent subvertical ridge (*r*), which in dorsal view appears as a conspicuous rounded tubercle, but the lateral slope of this ridge is more gradual and less steep than in *armatus;* this pit and ridge are above the level of the mesal angle of the posterior margin of the eye; below that level and almost directly ventral to the lower end of the pit is a distinct cicatrix (*pgc*), each consisting of three adjacent impressions (or possibly four on the left), the whole distinctly darker in color than the adjoining areas.

In the female of July 26, the superior ocular cicatrices consist of apparently a single impression each, the cicatrix on the right side of the rear of the head of two adjacent impressions, the corresponding cicatrix of the left side of but one impression; in all other respects this female agrees with the preceding description.

Of the other three females which have no superior ocular cicatrices, two (those of August 8) have the post-genal cicatrices, in one female consisting each of a single impression, but the scar of the right side larger than that of the left, the other female having the right cicatrix of two, the left of one, impression. The third female (August 4) shows no post-genal cicatrices although eggs are adhering to the ninth abdominal sternite and to other parts of her body. In other respects these three females agree with the description given above of the female of July 25.

A comparison of the male appendages and head of the female make it likely that, in pairing, the lateral apical angle (*p'*) of his superior appendages is received into the deep, post-genal pit (*p*), the mesal apical angle (*pgc'*) of the same causes the post-cephalic cicatrix (*pgc*), the outer division (fig. 8, *soc'*) of the apex of each branch of his inferior appendage sometimes producing the superior ocular cicatrix (*soc*) the acute superior basal tooth of each branch of the same appendage entering the superior pit (*dof*) of her occiput. I had thought at first that the *inner* division of the apex of each branch of his inferior appendage might be applied against the posterior surface of the elevation of her lateral ocellus, but the distance between the superior ocular cicatrix and the slight depression on the hind surface of this elevation of the same side of the head, in the two females which show these cicatrices, is too great to allow one to suppose that these two positions could be occupied by the divisions of the apex at the same time. Whether the cicatrices are made in the attempt to adjust the inner division of the apex to the ocellar elevations, or whether pairing may occur without this adjustment being made, must be determined by actual observations of the insects when mating. It should, however, be pointed out that the superior occipital pits of the female can not receive the superior basal teeth of the branches of the male's inferior appendage when the inner divisions of the apices of those branches are applied against her ocellar elevations, as the distance again is too great.

In the vertex of the male each lateral ocellus lies on the summit of an elevation which summit is much nearer (.14 mm.) to the mesal margin of the adjoining compound eye than to the mid-dorsal line of the head (.56 mm.); meso-caudad to each ocellus, but lower on the elevation, is a ridge or "wall" (Ris) whose crest is rounded and which in dorsal view shows as a curve with its convexity cephalad, the curves behind the two ocelli meeting on the mid-dorsal line; this ridge at no point is as high as the ocellus, as is the case in *E. subobtusus*. The elevations of the right and left ocelli are separated by a depression, which in posterior view is not deep as one-half of the height of either elevation.

In the vertex of the female the ridge or wall is lacking or indistinct and the depression between the two ocellar elevations is deeper, being more than one-half as deep as the height of either elevation when viewed from behind. The lateral ocelli are situated with respect to the compound eyes and the mid-dorsal line as in the male.

The occiput of the male has shallower dorsal pits and no supero-posterior tubercles, and the rear of his head is not differentiated into pit and ridge behind each eye.

Epigomphus subsimilis (Pl. XIII, figs. 1 to 3, 5 to 7.)

Of the seven females of this species none show any scars on the eyes or in the region of the ocelli comparable to those observed and described for *E. verticicornis* and other species, although two of these females yielded eggs from which larvae subsequently hatched, so that these two females must have paired. On the rear of the head, laterad to the level of each lateral end of the occiput (and consequently laterad to the level of the meso-dorsal margin of each compound eye) is a moderately deep pit (fig. 7, *p*); in each of these is one or two impressions which are probably cicatrices. Laterad to each pit is the inferior end of a pronounced vertical ridge (*r*, same figure), the end of which appears as a tubercle in a dorsal view of the head (fig. 5, *r*). Laterad this ridge is sharply delimited by a subvertical groove (*g*). A comparison of the male abdominal appendages and the female head makes it likely that when pairing the mesal apical angle of his superior appendage, with its ventral subacute process (fig. 2, *p'*) is received into the pit (*p*) and that the lateral apical angle (*g'*) of the same enters the groove, *g*, perhaps near or at its superior end. The position assumed by his inferior appendage is much more conjectural, but a reasonable hypothesis would be that the two apices thereof (*prs'*) are lodged in her parocular grooves (*prs*) between the lateral ocelli and the mesal margins of the eyes.

There are no such pronounced tubercles posterior to and distinct from the elevations on which the lateral ocelli lie as in *E. verticicornis*. The slope cephalad from the occiput to these ocelli is gradual, whereas in *verticicornis* the posterior wall of each postocellar tubercle rises almost vertically, thus furnishing a firm support against which the distal margin of the male's inferior appendage may be braced when pairing. Here no such possibility apparently exists.

On the dorsal surface of her occiput are two pits (fig. 5, *dof*) near the two lateral ends thereof; their appearance suggests that of the similarly situated depressions in some females of

E. subobtusus referred to *postea* under that species, but in none of the seven females of *subsimilis* is there any suggestion of tubercles replacing them.

The vertex and occiput of the male are similar to those of the female but the rear of his head is not differentiated into pit, ridge and groove. The vertices of the two sexes have been compared *antea*, page 334.

Epigomphus subobtusus (Pl. XIV, figs. 15 to 17.)

In this species the adaptations of the head of the female to the appendages of the male seem to be less marked than in any of the other species here treated. Two females from Costa Rica and three from Guatemala (as mentioned *antea*, pages 336 and 337) are before me. I find on the right side of the rear of the head of the female from south of Aguacaliente (fig. 17) what I take for a scar with some dried exudations attached; it is very distinct, is elongated, subvertical, its position corresponds to a level of about three-fifths the distance from the mesal eye margin of the dorsal surface of the head to the lateral surface of the eye, and its inferior end is on the same horizontal level as the mesad-directed angle of the posterior eye margin. It appears to correspond to the pit (*p*) rather than to the postgenal cicatrix of other species. No scar is observable on the left side of the head, not even in the "geringe Andeutung einer Struktur von der Art des *armatus*-♀; eine flache Vertiefung, neben der Medialwärts eine Wölbung steht, die aber in der Dorsalansicht nicht sichtbar[31] ist," described by Dr. Ris. No similar scars are visible on the heads of the other four females, nor do I find any scars on the dorsal surface of the head in any of the five specimens.

By analogy we should expect, of course, that the superior appendages of the male are applied against the rear of the head of the female, when pairing, and that the scar (*p*) above described marks the contact made by the lateral apical angle (*p'*, fig. 15) of the right appendage.

In both the description and figure of the female occiput in the *Biologia* volume I have indicated the presence of a pair of well-marked superior tubercles. Dr. Ris does not mention these and I find the following conditions to exist with respect to them in the present material. In the female from south of Aguacaliente, C. R., both of these tubercles are well developed and similar to the *Biologia* figure (figs. 16, 17, *dot*). In the female from below Juan Viñas

[31]In the five females before me the "Wölbung" *is* visible in what I should call a dorsal view of the head; *cf.* fig. 16.

the right tubercle is fairly conspicuous, while the site of the left one is indicated by a pit whose appearance suggests the possibility of its being the tubercle invaginated. The three females from Cayuga, Guatemala, are less mature than those from Costa Rica and may even be described as teneral; one of them (May 8) has the tubercles similar to the condition described for the Juan Viñas female, except that the left tubercle appears to be partly everted from its pit, the other two have a pit in the place of each tubercle, the margins of the pits more or less elevated as minute ridges. There is also a posterior tubercle (*pot*) on the occiput near each lateral end.

The distance between the apices of the inferior appendage of the male is distinctly greater than that between the pits or tubercles of the dorsal occipital surface of the female. It therefore seems unlikely that there is any correlation here, but that those apices rest, when pairing, farther cephalad on her head, probably in the parocular groove (*prs*) between the eye and the lateral ocellus of each side. In that case, a pair of shallow concavities (fig. 15, *dot'*) on the dorsal surface of the undivided basal part of this appendage, situated just proximad to the bases of the two branches, may receive the superior occipital tubercles of the female. Whether the pressure on these tubercles is ever sufficient to flatten them, or whether the eversion of the tubercles is a concomitant of the age or development of the individual female, and so would give the explanation of the differing conditions noted in the specimens above described, are questions which will probably require observations on the living insects to determine. Taxonomically it is important to recognize the differing state of the superior occipital tubercles in what appear to be females of the same species.

The vertex of the male is similar to that of the female.

The occiput of the male has dorsal pits, but less pronounced than in the female, but in no specimen before me has it either dorsal or posterior tubercles. The rear of his head is not differentiated even to the extent of that of the female.

On examining some of the original material of *Epigomphus llama* Calvert from Bolivia, I found a paratypic female from Chulumani, December 3, 1898, showing two well marked postgenal scars at about .35 mm. above (dorsal to) the level of the articulations of the cardines of the maxillae with the head, and about 1.05 mm. below (ventral to) the level of the mesal projection of each posterior eye-margin. I found that I could fit

the appendages of a male from the same locality and date to the head of this female so that the tips of his superior appendages rested in these postgenal scars; with the result that each branch of his inferior appendage came to lie in the parocular groove of the same side of her head, laterad of the ocellus but mesad of the antenna, the tip of each branch reaching cephalad to the superior surface of her frons, the superior anteapical process of each branch being received into the depression behind each of her antennae, the antenna being enclosed caudad by the concavity between the tip of the branch and that process. I was unable to detect any superior ocular scars on her head. Her superior, or dorsal, occipital tubercles are received by shallow concavities at each side of the dorsal surface of the base of his inferior appendage.

The position of the postgenal scars in *E. llama* female is thus much lower than in any of the Costa Rican species studied. This more ventral position is probably due to the more slender form of the superior appendages of the male *llama*, since their absolute length (2.10 mm. in dorsal view) is no greater than that of the same appendages of *E. subobtusus*. The inferior appendage of *llama* male also reaches farther cephalad on the female's head, apparently, than in any of the Costa Rican species. Here again the slenderness of the branches of this appendage is partly responsible for the difference, although the absolute length (2.1 mm. in ventral view) is greater than that of *subobtusus* (1.68 mm.)

It may be that relations similar to those of *E. llama* exist between the male appendages and female head in *E. obtusus* Selys and *E. hylaeus* Ris, also of the South American continent.[32] The Brazilian *E. paludosus* has the superior appendages of the male much shorter (1.62 mm.), so that probably they can not reach so far ventrad on the rear of the female's head; his inferior appendage (2.0 mm. long) is not so different from that of *llama* and may take a similar position on her head.

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[32]See the figures of *E. llama*, Ent. News, xiv, pl. viii, figs. 2 and 7 (1903), and Archiv f. Naturges., 82 Jahrg., Abt. A, 9 Heft, p. 152, figs. 99, 100, (1918), and for *obtusus* and *hylaeus* in the latter, p. 151, figs. 96, 97, and p. 154, figs. 102, 103.

On summing up the data given here and by Dr. Ris it appears that all species of *Epigomphus* thus far studied in both sexes show a differentiation in the two sexes in the rear of the head, this being least marked in *obtusus* and *llama* and most striking in *armatus*. The occiput of the two sexes is similar in *subsimilis* but more or less different in other species, *tumefactus* female showing the most complicated structure of this part. The vertices of male and of female are similar in *subobtusus*, *obtusus* and *subsimilis*, dissimilar in the others, the maximum of specialization being shown by *tumefactus* female in one way and by the females of *verticicornis* and *armatus* in another.

A comparison of the appendages of the males of these species with each other does not furnish any sure basis for deciding that these organs are more specialized in one species than another, since specialization, from a phylogenetic standpoint, may be either by reduction (atrophy) or by complication (hypertrophy). Perhaps we may take the testimony of the other sex on this question and infer that those male appendages are most specialized in the species whose female shows the greatest number of mating adaptations, irrespective of the degree of complication shown by the male appendages themselves.

Judged by similarity in head structure of the two sexes, *subsimilis* is the least specialized of the Costa Rican forms; it is a species in which the second pale antehumeral stripe (of both sexes) is represented only by a superior spot. Of the species which show the greatest differentiation in head structure between the two sexes, *armatus* has the second pale antehumeral stripe complete, while *tumefactus* and *verticicornis* are like *subsimilis* in this stripe.

The data given in this paper would seem to indicate that if the existing species of *Epigomphus* have come into existence gradually, none of them can stand in an ancestral position to any other, but that they represent end twigs of a fairly divergent genetic tree. On the other hand, of course, is the possibility of origin by mutation. By either hypothesis the most interesting feature of their evolution is that the two sexes appear to have been modified correlatively in structures concerned in the act of mating so essential to the continuance of the race. It would be desirable to ascertain whether these correlations are so exact as

to prevent crossing between different "species." A comparison of the figures on Plate XV, illustrating *verticicornis* and *armatus* shows that, although the females of both species agree in possessing strong postocellar tubercles (*poct*), they differ markedly in the rear of the head and in the positions of the superior ocular scars (*soc*), while the appendages of their respective males are very different. The presumption would seem to be that these two species would not cross, but we have as yet no observations to control our speculations. On the other hand, I can see no *a priori* reason why the male say of *quadriacies* might not mate with the female of *subsimilis* or of *subobtusus*, but of course mere mechanical ability to pair is no assurance of the production of fertilized ova. It may be that a long time will elapse before we have positive answers to these questions, but their solution should not be of insuperable difficulty.

Explanation of Plates

Homologous parts of the heads of females of different species are marked with the same letters. The parts of the males' appendages which receive, or are received by, certain parts of the females' heads are marked with the same letters as the head parts, but with the addition of the prime mark (′). It results that homologous parts of the males' appendages in different species are not always designated by the same letters. The following letters are used in many of these figures:

dof, dorsal occipital pit (fossa);[33]
dor, dorsal occipital transverse ridge;[33]
dot, dorsal occipital tubercle;[33]
g, groove on the rear of the head (postgenal sulcus or groove);
ll, impressed lines on the same;
los, lateral ocellar groove (sulcus);
mvs, median vertex groove (sulcus);
p, pit on the rear of the head (postgenal fossa or pit);
pgc, postgenal scar (cicatrix) or scars;
poct, postocellar tubercle;
pot, posterior occipital tubercle;
prs, parocular groove (sulcus);
r, ridge on rear of head (postgenal fastigium or ridge);
soc, superior ocular scar (cicatrix) or scars;
tr, transverse posterior ridge of vertex.

Unless otherwise stated, all the figures on these three plates have been drawn with the camera lucida, drawing at stage level, with Zeiss compensating ocular no. 2, objective A (lower lens *off*), and their average magnification on the plates is 8.0. Details were added by freehand, using a Zeiss binocular with paired oculars 4 and paired objectives F 55.

All the drawings by the writer.

Plate XIII

Figs. 1 to 7.—*Epigomphus subsimilis* new species. Turrúcares, Costa Rica, August 14, 1909, type ♂ and allotype ♀. 1 to 3 and 6—left profile, dorsal, ventral and caudal views respectively of the apex of the ♂ abdomen. 4—Genitalia of the second abdominal segment ♂, extruded, left profile view; objective A here with lower lens *on* × 12.6; *hp*, posterior hamule; *lig*, ligula (Schmidt) or sheath of the penis; *pn*, penis; *vp*, vesicle of the penis; *pn* 2, morphologically dorsal surface of the apex of the penis; *ha*, apex of anterior hamule (concealed within the posterior hamules) and *lig.p*, apex of lateral process of ligula, drawn free hand and on a larger scale. Figs. 5 and 7.—Dorsal and caudal views respectively of head of female.

[33]These three, pit, ridge and tubercle, are probably homologous; see under *E. suboblusus, antea*, pages 348–9.

Figs. 8 to 10.—*E. quadracies*, Rio Chirripo, C. R. 8.—Dorsal view of apex of abdomen of ♂ of July 26, 1915. 9 to 10.—Dorsal and caudal views respectively of head of ♀ of July 25, 1915.

Plate XIV

Figs. 11 to 14, 18 to 22.—*E. tumefactus*, Florida Road, June 3, 1909, ♂ and ♀; in figs. 11–14, 18–19, the proximal end is upper in every case. 11 and 12.—Right third femora, anterior surface, ♀ and ♂ respectively. 13 and 14.—Right third tibiae, anterior surface, ♀ and ♂ respectively. 18 and 19.—Right third tarsi, anterior surface, ♀ and ♂ respectively. 20.—Dorsal view of apex of ♂ abdomen; *d*, denticles of inferior appendage. 21 and 22.—Dorsal and caudal views respectively of head of female; the postgenal scars *pgc*, of Biolley's female have been added to fig. 22.

Figs. 15 to 17.—*E. subobtusus*. 15.—Dorsal view of apex of abdomen of ♂, Juan Viñas, C. R.; the superior appendages of this individual are not as widely distended as they probably are when mating. 16 and 17.—Dorsal and caudal views respectively of head of female from south of Aguacaliente, C. R.

Plate XV

Figs. 23 to 26.—*E. verticicornis*, Tuis, Costa Rica, type ♂ and allotype ♀. 23.—Inner dorsal oblique view of left superior appendages and left half of inferior appendage ♂; *rs*, base of right superior appendage; *x'*, "downwardly directed spine" of the inner (mesal) surface of the left superior appendage; *y*, "forwardly curved spine" of the dorsal surface of the basal part of the inferior appendage. 24.—Dorsal view of apex of abdomen of ♂, appendages somewhat distorted; *y*, as in fig. 23. 25 and 26.—Dorsal and caudal views respectively of head of female; *x*, linear depressions mentioned in text, page 340.

Figs. 27 to 30.—*E. armatus*. 27 and 28.—Ventral and left profile views respectively of apex of abdomen of ♂, copied from Dr. Ris's figures 92 and 93; left superior appendage removed in figure 28; magnification not stated. 29 and 30.—Dorsal and caudal views respectively of the head of ♀ from the Florida Road of June 5, 1909; the superior ocular cicatrices (*soc*) from the female of June 3, have been added to fig. 29.

NEW GENERA AND SPECIES OF MELANOPLI FOUND WITHIN THE UNITED STATES

(ORTHOPTERA; ACRIDIDAE)

BY MORGAN HEBARD

Part III

For over five years preliminary work has now been progressing in preparation of the series of the Melanopli, in the Philadelphia Collections, for revisionary treatment of this group as found within the United States.

A large number of the species are found abundantly over extensive areas and the problem of handling series of very large size has proved difficult. In order to avoid original descriptions in the final work, which will in itself necessarily be very large, we have, in the sorting, put aside the material representing new species or races, and have followed the plan of publishing on all of these in advance of the comprehensive treatment.

The present paper is the third of the resultant publications, of which our "Notes on Mexican Melanopli"[1] might be said to be the forerunner, as indicating the general arrangement, as understood by us, of the Melanopli known from that country. In our first paper,[2] only species other than those of the genus *Melanoplus* were treated. In the second,[3] a number of species of *Melanoplus* were described. Since that time the general affinities as indicated by us have required no readjustment, except that in the genus *Melanoplus* the order throughout has been reversed.

The present linear arrangement of the genus *Melanoplus*, which places the majority of the macropterous species first and the brachypterous species last, is used by Morse in his recent most excellent treatment of the New England species.[4] The reason is that brachypterism in the Melanopli indicates specialization from a macropterous and more primitive type. In the

[1]Proc. Acad. Nat. Sci., Phila., 1917, pp. 251 to 275, (1917).

[2]Trans, Am. Ent. Soc., XLIV, pp. 141 to 169, (1918).

[3]Trans. Am. Ent. Soc., XLV, pp. 257 to 298, (1919).

[4]Manual of the Orthoptera of New England. Proc. Boston Soc. Nat. Hist., XXXV, pp. 197 to 556, (1920).

system of linear arrangement we strive to place the simplest forms first in a genus, grading up to the type of highest specialization.

The number of new species described in these preliminary papers is apparently large, but, considering the great size of the series now assembled for the study of the Melanopli, an even greater number of undescribed forms might easily have been expected. The number of species now appearing in the literature as valid is far in excess of the number recognized by Scudder. The series now before us, however, prove that very many recognized species, particularly among those described by that author, are mere synonyms. The completion of the studies of the Melanopli, found in North America south to the Mexican border, will consequently show that only a slightly greater number of known and valid species occur over this territory than were supposed to occur by Scudder in 1897.

The work of assembling sufficient material for a comprehensive study has been progressing steadily and the expedition during the summer of 1919, undertaken by Mr. Rehn and the author, was particularly successful. We believe that, for the region, practically all the widely and generally distributed forms are now known. In the western mountains, however, and particularly in the more isolated high areas, we are confident that intensive search among the lesser known ranges will reveal the presence there of numerous new species and geographic races.

Under the new species and the new geographic race assigned to the Gracilis Group of the genus *Melanoplus*, we have occasion to criticise the recent work of Mr. Blatchley.[5] We are compelled to do this, as that author appears to be unable to differentiate between the variation found in the genitalia of some more plastic species and the differences shown in varied degree by the more constant genitalic features of other less plastic, though often closely allied, species. The most serious situation lies, however, in that the author's apparent ignorance of what is meant by contemporary biologists when treating an entity such as is termed a geographic race. We are certain that the geographic race must be recognized. We feel that the day is past when the entomologist labelled and ticketed as species, without further

[5]Orthoptera of Northeastern America, pp. 1 to 784, (1920).

comment, each specimen which had certain conspicuous features of difference. The geographic race is more subtle, and, to determine its validity, requires more thorough study and consideration of much more material than does the species. In the Melanopli the distinction between some species is far less striking than that between others, while the weighing of all evidence which can possibly be obtained is essential to determine the validity of certain geographic races.

As a result we find Morse's thorough, deliberate and conscientious work on the Melanopli almost universally correct. Blatchley is equally correct in considering most of the species distinguished by strikingly apparent features, but, with hardly an exception, he has failed to recognize the true values of the species or races wherever finesse or elaborate analysis was necessary. We regret that there is need to make so drastic an assertion as the above, but when we find an individual, after cursory examination of types and without time being given for study of the series available, attempting to relegate to oblivion numerous entities described by both Morse and ourselves, after years of study, incurring detailed and not hit or miss consideration, we feel obliged to speak.

It is a fundamental requirement in scientific work that no man synonymize or change the values of names appearing in the literature, without giving definite reasons for such action. Such reasons must be based on careful consideration and thorough analyses of all available evidence. Blatchley has not observed this requirement in his recent work.

In the present paper twelve new species and two new geographic races are described. The series of these new forms contain 939 specimens, of which all but 102 are in the Philadelphia Collections.

We take the present opportunity to thank for the loan of material, particularly important in determining the problems surrounding *Melanoplus viridipes*, Mr. J. R. Malloch of the Illinois State Laboratory of Natural History, Mr. Wm. T. Davis of New York, Mr. W. S. Blatchley of Indianapolis, Indiana, Professor A. P. Morse of Wellesley, Massachusetts, Mr. A. N. Caudell of the United States National Museum and Doctor Henry Fox of Macon, Georgia.

Oedaleonotus borckii orientis new subspecies (Plate XVI, fig. 1.)

This geographic race is at present known only from the higher portions of southern and northeastern Nevada. Westward its limit of distribution certainly occurs before the Sierran uplift is reached, as in that region *borckii pacificus* (Scudder) is found.[6]

We find *borckii orientis* to be very close to typical *borckii*, though not as close as *borckii pacificus*. It differs in the average smaller size, more grayish general coloration, proportionately wider interval between the tegmina of both sexes and caudal femora with internal and ventral surfaces yellow, showing no tinge of orange.

Like typical *borckii*, the present race differs from *borckii pacificus* in having the lateral bands of the pronotum weak or subobsolete on the metazonal portion of the lateral lobes. Though variable in intensity in all the races of this species, these bands are normally percurrent and much the heaviest in *borckii pacificus*, this feature being indeed the best one to distinguish that very weakly defined race from typical *borckii*.

Type.—♂; Lee Canyon, Spring Mountains, Clark County, Nevada. Elevation, 7000 feet. August 19, 1919. (Rehn and Hebard.) [Hebard Collection, Type no. 552.]

Size medium small for the genus, averaging smaller than in typical *borckii*, though no smaller than the average in *borckii pacificus* from the southern Sierras; form medium for the genus. Head and pronotum as in *borckii borckii*. Pronotum with medio-longitudinal carina well developed cephalad and caudad of the decided transverse sulci, subobsolete between these; lateral carinae weak, showing slight divergence caudad; caudal margin of disk very weakly obtuse-angulate produced. Tegmina elongate oval, separated by a marked interspace (.9 to 1.2 mm. in the type and series of paratypic males[7]). Genitalia as in *borckii borckii*, the furcula very small, the cerci very slender and incurved distad. Prosternal spine short and sharply conical. Important features are noted in the color description.

[6]Study of the extensive series now at hand shows Scudder's *Melanoplus pacificus* to be a very weakly defined geographic race of Stål's *Acridium* (*Podisma*) *borckii*.

[7]This is subject to further variation, as the two Crestline and Ruby Range males before us have the tegmina broad oval and separated by an interspace .5 mm. in width. In males of the other races of *borckii* the tegmina usually slightly overlap or are attingent, in rare cases separated by an interspace, the maximum in the series before us being .6 mm. in width, in individuals of much larger size than those of *borckii orientis*.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Similar to the male type except in the following features. Size decidedly larger, form robust. Pronotum similar (the series showing that the carinae and sulci are often weaker in this sex). Tegmina elongate ovate, slightly broader and separated by a wider interspace (1.4 to 1.9 in the allotype and paratypic females.[8])

Measurements (in millimeters of extremes)

♂	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
Lee Canyon, Nevada, *type*	14	3.3	2.3	2.8	1.8	8.3
Lee Canyon, Nevada, *paratypes* (13)	14–16	3.3–3.8	2.3–2.6	2–2.9	1.6–2	8.2–9.3
Crestline, Nevada	13.5	3.4	2.3	2.7	2	8.7
Ruby Range, Nevada	15	3.8	2.6	2.6	2.1	9
♀						
Lee Canyon, Nevada, *allotype*	19	4.6	3	4	2.3	10.7
Lee Canyon, Nevada, *paratypes* (33)	16.8–20	4–4.8	2.6–3.7	2.7–4	1.8–2.4	9–11.3
Crestline, Nevada (4)	16.2–18.7	4–4.4	2.7–3	2.3–3.4	2.2–2.7	9.6–9.9

The Spring Mountains series shows that, in the two thousand five hundred feet of vertical distribution through which this race was there found, the individual size remains unaffected.

Color pattern obscure. Type with head light pinkish cinnamon, occiput and cheeks minutely flecked with mummy brown, the former with a mediolongitudinal band of that color, which widens caudad, this band varying to weak or wholly obsolete in the series; a broad postocular band of mummy brown on each side, this varying to very weak in the series. Pronotum light pinkish cinnamon suffused and flecked with mummy brown, the post-ocular bar continued and occupying the dorsal half of the lateral lobes, but weakly defined, usually bister fading to snuff brown on the metazonal portions and frequently with a buffy fleck at the terminal portions of the principal sulcus. Tegmina light pinkish cinnamon suffused with bister, this least in dorsal portions and frequently deepening to blackish proximad near the costal margin. Abdomen light pinkish cinnamon, the proximal tergites heavily and extensively marked with black laterad. Antennae and cephalic and

[8]The females from Crestline have the pronotal carina and sulci more decided than in any from the typical series and the tegmina wider, broad oval, so that the interspace between these averages less (.3 to 1.1 mm.). The Crestline material probably shows in these features incipient geographic racial differentiation, as yet not sufficiently advanced to warrant nominal recognition. The differences discussed show convergence toward *borckii pacificus*, but the examples in all other respects are typical of the present race.

median limbs suffused sayal brown, tinged with greenish distad. Caudal femora sayal brown in exposed portions, with two weakly defined bars of bister, which beginning on the dorsal portion of the internal face run across the dorsal face, being very weak on the external section and, with a more proximal suffusion, make up the usual color pattern of the pagina, as found more conspicuously developed in other forms of the genus; ventral and ventro-internal portions barium yellow. Caudal tibiae with external surface whitish, heavily overlaid with niagara green, other surfaces niagara green, except in brief proximal whitish portion; spines white in proximal portions, black distad.

The series shows little color variation from the type described. In some the coloration is more generally sayal brown, in others bister with pale areas of exposed surface of caudal femora contrastingly cinnamon. The Crestline series shows the weakest color pattern of all, the general coloration being tawny-olive.

Specimens Examined: 54; 16 males and 38 females.

Nevada: Lee Canyon, Spring Mountains, 6000 to 8500 feet, VIII, 18 to 21, 1919, (Rehn and Hebard), 14 ♂, 34 ♀, *type*, *allotype* and *paratypes*. Crestline, Juniper Mountains, 6000 feet, IX, 4, 1909, (Rehn and Hebard), 1 ♂, 4 ♀. Northern foothills of Ruby Range, Elko County, 5800 feet, IX, 18, 1919, (Hebard), 1 ♂.

In the Spring Mountains this insect occurs through the zone of juniper and pinyon and well up into the zone of the bull pine (*Pinus ponderosa douglasi*). It reached its greatest numerical abundance, being moderately numerous and widely distributed, in the sparse grass and low green plants growing on pebbly soil at 7000 to 7200 feet, where the junipers and pinyons also reached their optimum development. At Crestline it was very scarce, the specimens being found singly and widely scattered, occurring in areas where a low yellow-flowered composite and sage brush grew among the scattered junipers and pinyons. The single individual taken at the foot of the Ruby Range was found under conditions similar to those at Crestline.

Bradynotes albida new species (Plate XVI, figs. 2 and 3.)

This interesting species shows nearest relationship to *B. excelsa* Rehn (plate XVI, fig. 4), differing in a number of color features and particularly in the more whitish general coloration, the subobsolete principal transverse sulcus of the pronotum, carinate abdomen and distinctive type of male cerci.

These two species are of broad form, but by no means as broad as the other species of *Bradynotes*. They inhabit the upper

zones of the High Sierras, being found in a more rigorous environment than other species of the genus.

The cercal abbreviation in *albida* is exceeded only in *B. satur* Scudder, a very distinct species.

Type.—♂; Lone Pine Lake, Whitney Pass Trail, Sierra Nevada Mountains, Inyo County, California. Elevation, 10,000 to 10,100 feet. September 6, 1919. (Rehn and Hebard.) [Hebard Collection, Type no. 565.]

Size small for the genus, form rather heavy. Surface subglabrous, well supplied with elongate though exceedingly fine hairs. Head broad and full; vertex gently tumid, fastigium very shallowly concave between eyes, the lateral margins not at all carinate; frontal costa deplanate, showing very slight depression at the median ocellus, there as wide as the interocular space, immediately below that portion suddenly narrowed by a fine but distinct and sharply curved sulcus on each side, completely obliterated below, where the face, above the clypeus, is evenly convex. Eye only slightly longer than wide, one and one-third times as long as the infra-ocular sulcus. Pronotum short, with disk rounding into the lateral lobes without carina, lateral lobes with prozonal section moderately inflated in dorsal portion, this cut vertically by the median transverse sulcus, which on the disk is weakly indicated mesad and obsolete meso-laterad, first transverse sulcus distinct only on disk, principal transverse sulcus subobsolete on disk; medio-longitudinal carina of disk weakly indicated near cephalic margin and on metazona, elsewhere obsolete; caudal margin of disk almost transverse, very broadly obtuse-angulate emarginate at the intersection of the nearly transverse though very broadly convex halves. Tegmina and wings absent. Abdomen with a fine but distinct medio-longitudinal carina. Furcula represented by two slightly produced convexities of the tergite at its median emargination. Supra-anal plate elongate shield-shaped, raised in a weak shoulder at lateral margins on each side at end of proximal two-thirds, lateral portions broadly and deeply concave, median portion raised, in proximal half with surface concave between heavy convergent lateral carinae, in distal half weakly convex except for a small sub-apical impression. Cerci small, not twice as long as proximal width, lateral margins very weakly concave, converging to near apex, there the dorsal margin curves obliquely downward to the sharply rounded apex. Subgenital plate roughly conical, tapering to the produced and bluntly rounded apex, with surface ventro-mesad showing a weak concavity, lateral margins almost straight to apex. Cephalic and median femora slightly inflated, very weakly bowed.

Allotype.—♀; same data as type. [Hebard Collection.]

Much larger and more robust than male. Head with interocular space wider and showing scarcely any concavity, frontal costa at median ocellus four-fifths as wide as the interocular space. Pronotum similar to that of

male, except that the inflated portions of the lateral lobes are weaker. Ovipositor[9] valves showing very weak curvature to their rather blunt apices, with no median shoulders and having the margins of contact subcrenulate. Cephalic and median femora not inflated and scarcely bowed.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotal disk at principal sulcus	Length of caudal femur
Lone Pine Lake, California, *type*	15.8	3.4	3.1	8.2
Lone Pine Lake, California, *paratypes* (8)	15.8–16.2	2.9–3.8	3–3.3	8.1–9
Mount Whitney California, (2)	17.4–17.9	3.8–4	3.3–3.4	9–9
♀				
Lone Pine Lake, California, *allotype*	24.7	3.9	4.3	10.3
Lone Pine Lake, California, *paratypes* (7)	23–25	3.6–4.1	4–4.1	9.7–10.3
Lone Pine Lake, California, *paratype*[10]	21	3.2	3.7	8.4
Mount Whitney California, (4)	24.4–25.5	3.8–4.3	4.3–4.6	10.2–10.7
Mount Gould, California,	23.2	4.	4.4	10

General coloration of head, prozonal portion of pronotal disk and exposed surfaces of femora cartridge buff, showing even more whitish in life than in dried specimens. Head with two postocular bars on each side of velvety black, the occiput flecked and suffused with velvety black, particularly caudad. Pronotum with prozonal portion of disk shading from cartridge buff to whitish laterad, metazonal portion of disk chamois; lateral lobes with a suffused metazonal band of velvety black dorsad, this individually extremely variable in width, remaining portions chamois. Mesonotum and metanotum suffused with black, the latter with a pale fleck on each side, which is usually conspicuous. Dorsal surface of abdomen honey yellow, the third and fourth tergites suffused with black. Ventral surface chamois, becoming ochraceous on caudal portion of sternum and on abdomen. Cephalic limbs cartridge buff marbled with a tinge of black, this more decided distad on the cephalic faces of the tibiae. Caudal femora cartridge buff, dorsal surface with a proximal fleck, a broad meso-proximal band, a weak medio-distal band and genicular areas black; the heavier band is continued to the median line on the external pagina, the weaker band invading that area only briefly, while

[9] In the species of this genus the ovipositor is carried with only the distal portion projecting. When in active use, however, it is probable that this organ can be fully extruded. Six specimens in the present series have been dried with the ovipositor in that position.

[10] This specimen, though having the ovipositor fully developed, appears to retain certain nymphal features.

homologous markings occur on the ventral face, these reaching to the ventral margin of the external pagina. Caudal tibiae proximad dark, then with a broad annulus of cartridge buff, the remaining portions pinkish buff, suffused proximad and distad; tarsi pinkish buff; spines pinkish buff with immediate apices black, spurs pinkish buff with distal half black.

In some specimens the ground coloration varies toward vinaceous-cinnamon, in discolored examples approaching mikado brown. The degree of intensity and extent of the black suffusions and markings is variable.

The coloration of the sexes is similar and in no specimens is the general coloration dark or the ventral surfaces of the caudal femora richly colored as in *excelsa*.

Specimens Examined: 28; 11 males, 15 females and 2 immature individuals.

California: Mount Gould, Fresno County, 12,000 feet, VII, 9, 1910, (E. C. Van Dyke), 3 ♀, [Cal. Acad. Sci. and Hebard Cln.]. Pinnacles of Mount Whitney, Sierra Nevada, Tulare County, 13,770 feet, IX, 7, 1919, (M. Hebard), 1 juv. ♀. East foot of Whitney Pass, Sierra Nevada, Inyo County, 12,000 to 12,500 feet, IX, 7, 1919, (M. Hebard), 2 ♂, 4 ♀. Lone Pine Lake, Whitney Pass Trail, Sierra Nevada, Inyo County, 10,000 to 10,100 feet, IX, 6, 1919, (Rehn and Hebard), 9 ♂, 8 ♀, 1 juv.? ♀, *type*, *allotype* and *paratypes*.

At the base of a two thousand foot north-facing precipice, just above Lone Pine Lake, a rather extensive detrital slope of gray decomposed granite was examined on September sixth. Scarcely any vegetation grew there, but a specimen of this species was found on the bare gravel between the boulders. Intensive search showed the insect to be widely distributed over this apparently barren area, though very scarce and difficult to see, due to its exceedingly protective coloration. Our notes say—"One male was watched. It would take two or three short toad-like leaps, then climb up on the nearest granite pebble with spider-like agility and, after weaving slightly from side to side once or twice, would come to rest. It then blended absolutely with its surroundings."

On the following day the author found an immature individual far above timber line, among the pinnacles of Mount Whitney, on bare granite sand. No vegetation was noted anywhere near that elevation except lichens and one or two dandelions in a rock crevice. Below, at the head of Lone Pine Canyon and ascending Whitney Pass, six adults were taken. At the lower elevation there were a few arctic-alpine plants in the granite debris, at the upper elevation hardly any vegetation of any sort.

Melanoplus splendidus new species (Plate XVI, figs. 5, 6 and 7.)

This handsome insect is a member of the Punctulatus Group, showing a close superficial resemblance to *M. punctulatus arboreus* (Scudder), but differing in features of coloration, in the very different and less highly specialized male cerci and the less produced male subgenital plate.

Type.—♂; Jemez Hot Springs, Jemez Mountains, New Mexico. Elevation, 7500 feet. August 18, 1913. (John Woodgate.) [Hebard Collection, Type no. 562.]

Size medium large for the genus, form moderately robust. Vertex rather decidedly depressed between the lateral carinae, which latter are continued on the frontal costa to below the median ocellus, frontal costa broader and shallowly depressed between the lateral carinae. Eye slightly over twice as long as the infraocular sulcus. Pronotum with medio-longitudinal carina very weak but percurrent on prozona though weakest in mesozonal section, well developed on metazona; transverse sulci distinct, the principal sulcus scarcely heavier than the others; disk with lateral margins slightly divergent between first and principal sulcus, in other portions subparallel, caudal margin rather broadly obtuse-angulate produced with apex rounded. Tegmina fully developed, extending beyond caudal femora and abdomen, the rather narrow apex broadly rounded. Prosternal spine elongate, cylindro conical with apex rather sharply rounded. Furcula indicated on the surface of the tergite as broad, weakly convex areas, their broadly convex caudal margins projecting slightly beyond the caudal margin of the tergite, between which the tergite is rather broadly cleft to near its base. Supra-anal plate shield-shaped, lateral margins convex proximad, then broadly convex and moderately convergent to apices of latero-caudal carinae where a slight emargination on each side occurs, the remaining distal portion with margins straight, decidedly convergent, forming a rectangle with apex sharply rounded; medio-longitudinal sulcus percurrent, decided in slightly less than proximal half, weak in slightly more than distal half, subobsolete and very delicate transverse carina indicated at the juncture of these portions, lateral portions of plate broadly concave to disto-lateral carinae, these represented by parallel rounded ridges, well developed and slightly over twice as long as broad. Cerci broad at base, narrowing strongly in proximal two-fifths, margins subparallel in median fifth, the width there three-fifths as great as that proximad, distal two-fifths moderately expanded, three-quarters as wide as basal width, with a moderate upward and inward curvature; ventral margin straight in proximal three-fifths; thence broadly convex to the rather broadly rounded apex, situated dorsad; dorsal margin strongly concave to distal portion where it is very feebly convex.[11] Subgenital plate moderately broad, apically

[11] This is seen to be a development from the same source as *p. arboreus*, but in *splendidus* the disto-ventral lamellate expansion, so strongly developed in that insect, does not occur, and as a result the general appearance of the cerci is very different and distinctive.

abruptly elevated and thickened in a truncate projection, the apical production thus formed nearly four times as broad as thick and slightly broader than high.[12]

Allotype.— ♀ ; same data as type, except that it was taken at 6400 feet on August 24, 1913. [Hebard Collection.]

Agrees with the type except in the following features. Size much larger, form decidedly more robust. Sulci and lateral carinae of the broader vertex and frontal costa much weaker, present on frontal costa only about region of median ocellus. Eye appreciably less than twice as long as infraocular sulcus. Medio-longitudinal carina of pronotum more conspicuous, particularly in metazonal portion. Tegmina and wings showing distinct reduction, extending slightly beyond caudal femora (failing to reach this point by a brief distance in the paratypic females), failing to reach the apex of the abdomen by a brief distance. Ovipositor valves with distal curvature decided particularly for the dorsal pair.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Greatest width of pronotal disk	Length of tegmen	Length of caudal femur	Width of caudal femur
Type	25 7	5 8	3 4	21	14	3 7
Paratype	25 8	5 9	3 4	19 2	13 2	3 7
♀						
Allotype	38 2	7 4	5	23 5	17 6	4 3
Paratypes (4)	34–40	6 8–7 5	4 6–5	18 7–23	15 8–17 3	4 4 8

Head grayish olive, maculate with dark grayish olive, on each side with a broad and shining postocular bar of blackish mummy brown. Pronotum with disk heavily overlaid, except rather broadly along lateral margins where the suffusion is weaker, with bone brown[13]; lateral lobes buffy, heavily flecked and suffused with bone brown, in the dorsal area the blackish mummy brown postocular bar is continued, much broadened but irregular with pale patches, so that the appearance is more that of a suffusion than of a bar. Tegmina hair brown, flecked with blackish, particularly along median line of costal fields. Wings transparent, hyaline, tinged with glass green proximad; veins black in all but caudal portion of axillary field, where they are glass green. Cephalic and median limbs hair brown, flecked and irregularly blotched, particularly on the external surfaces of the femora, with blackish

[12] This shows similarity in general structure to the type developed in *M. punctulatus punctulatus* and *p. arboreus*, the distal specialization being very much greater and normally more acute in those races and much the more decided in *p. arboreus*. Thus, in this respect only, *p. punctulatus* shows a condition about intermediate between that developed in *splendidus* and in *p. arboreus*.

[13] The suffusion is seen to be weak, with many darker flecks, under the microscope.

mummy brown. Caudal femora drab externally, with proximal and geniculars blotches and two intervening bars of darker brown very weakly defined; internal face dorsad with the corresponding darker areas more decided, blackish mummy brown, below and particularly in proximal portion bright ox blood red, often shading toward carmine. Caudal tibiae hair brown, shading to ox-blood red in distal half, this brilliant on flexor surface but merely tinging the extensor surface, external spines black, internal spines and all spurs buffy, black tipped.

In the series the general grayish coloration shows a more brownish tinge in individual specimens, the darker streaking and dotting showing little variation in intensity. The females have the dark and paler markings of the caudal femora averaging more decided than in the males. In these the pale areas are composed of an irregular proximal section, beyond this a marking like a short feathered shaft of an arrow meso-proximad, a large meso-distal section with margin produced proximad in a V and an irregular pregenicular band, these areas individually ranging from pinkish buff to clay color.

Specimens Examined: 8; 2 males and 6 females.

New Mexico: Jemez Hot Springs, Jemez Mountains, 7500 feet, VIII, 14 to 20, 1913, (John Woodgate), 2 ♂, 1 ♀, *type* and *paratypes;* 6400 feet, VIII 24 and IX, 17, 1913, (John Woodgate), 2 ♀, *allotype* and *paratype*; no elevation given, VIII, 13, 1911 and VIII 25, 1914, (John Woodgate), 2 ♀, *paratypes,* [all Hebard Cln.]. Jemez Mountains, VIII, 1909, 1 ♀, *paratype,* [Hebard Cln.].

Melanoplus eumera[14] new species (Plate XVII, fig. 1; plate XVIII, fig. 1.)

1902. *Melanoplus robustus* Scudder and Cockerell (not *Caloptenus robustus* Scudder, 1875), Proc. Davenport Acad. Sci., IX, p. 50. [Organ Mountains, New Mexico.]

This insect is a member of the Ponderosus Group, showing nearest relationship to *ponderosus* (Scudder) (plate XVIII, fig. 2) and supplanting that species westward of the Pecos River in Texas.

The major difference between these species is found in the male cerci, though a normal specimen of *eumera* appears to be very strikingly and differently marked and colored from a normal specimen of *ponderosus*. On closer examination, however, these latter differences are seen to be the result of an intensification and consolidation of the color pattern in *eumera*, showing less actually diagnostic differentiation than might at first be presumed, and the convergence of the color pattern between recessively

[14] From εὐμηρά = beautiful thighs.

colored examples of *cumera* and intensively colored specimens of *ponderosus* is decided.

Both species are at their best in a semi-arid environment. Hence *ponderosus* is widely and generally distributed through the semi-arid belt of central Texas, while the distribution of *cumera* is more local, the species being largely confined to the semi-arid sections of the mountains of Trans-Pecos Texas and southeastern New Mexico, the surrounding desert country apparently being too dry for this insect.

Type.—♂; Lost Mine Peak, Chisos Mountains, Texas. Elevation, 5500 to 6500 feet. September 6, 1912. (Rehn and Hebard.) [Hebard Collection, Type no. 560.]

Size large, form robust (averaging smaller and less robust than *ponderosus*). Vertex distinctly narrower than in *ponderosus*, interocular space very slightly wider than proximal antennal joint, the vertex with surface weakly depressed to fastigio-facial angle, the frontal costa weakly depressed in vicinity of the median ocellus. Eye nearly twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina well developed on metazona, subobsolete except briefly cephalad on prozona, principal sulcus deep, other transverse sulci weak; disk with lateral margins almost subparallel, very feebly diverging caudad, caudal margin obtuse-angulate produced with apex sharply rounded. Tegmina and wings fully developed (in series falling slightly short of apices of caudal femora to extending a brief distance beyond apex of abdomen). Prosternal spine as in *ponderosus*, rather elongate, subcylindrical, slightly larger mesad than proximad, tapering fairly suddenly at distal extremity to the rather sharply rounded apex. Furcula represented by two small, bluntly obtuse-angulate productions of the tergite. Supra-anal plate as in *ponderosus*, broadly shield-shaped, the lateral margin briefly convergent and weakly convex, then subparallel, the distal margin strongly bracket-shaped; medio-longitudinal sulcus broad and deep proximad, narrower meso-distad, subobsolete distad, lateral portions broadly concave, the disto-lateral carinae indicated by small convexities which are slightly longer than broad. Cerci of same type as developed in *ponderosus* but smaller, with distal lobe less ample, its axis forming a more obtuse angulation with axis of shaft, its ventral margin not evenly convex. Cercus with margins of shaft in proximal two-fifths weakly convergent, the distal three-fifths formed by a lobe directed dorso-distad, not in-bent, longer than broad, about one and one-quarter times as broad as the basal width of the cercus, its margins broadly convex, the ventral margin at its base forming a minute angulate production with the ventral margin of the shaft, which distad begins to curve ventrad. Subgenital plate full, broad, its dorsal free margins laterad broadly concave to the moderately broad, transverse, thickened and briefly elevated meso-distal portion.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Agrees with male except in the following respects Size larger, form more robust. Vertex broader, the vertex and frontal costa with depressed areas even weaker. Eye one and three-quarters times as long as infra-ocular sulcus. Tegmina (averaging) slightly shorter (in the series falling a brief distance short of the apices of the caudal femora to extending as far as the apex of the supra-anal plate). Ovipositor valves rather elongate, with distal curvature moderately decided.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Length of caudal femur	Width of caudal femur
Lost Mine Peak, Texas, *type*..	29.5	6.8	4	21.5	15.6	4.4
Lost Mine Peak, Texas, *paratypes* (18)....	25.5–30	6–7	3.8–4.3	17.4–22.7	13.8–16.8	3.8–4.7
Chisos Mountains, Texas[15] (13).....	26.7–31.7	6.2–7	4–4.4	17–22.7	15–16.8	4.1–4.5
Sanderson, Texas.....	32	7.7	4.1	24.2	18	4.9
Organ Mountains, New Mexico (2)....	26.5–28.8	6.4–6.4	3.8–3.8	19.5–20.5	15.1–15.7	4.4–4.3
♀						
Lost Mine Peak, Texas, *allotype*.....	34[16]	7.3	4.8	20.7	17	4.6
Lost Mine Peak, Texas, *paratypes* (8).....	30.7–39.7	7.3–8.4	4.7–5.7	19.8–22.8	16.2–19.2	4.2–5.2
Chisos Mountains, Texas[15] (12).....	36.4–40	8.6–9	5.6–5.7	23.1–26.4	19–19.8	5–5.3
Sanderson, Texas.....	42	9.2	5.9	28	21.2	5.3
Organ Mountains, New Mexico (2)...	37–35[16]	8–8.6	5–5.2	21.8–23	18.2–20	5–4.8
Florida Mountains, New Mexico.....	36	7.4	4.8	19.2	17	4.1

[15] In canyon behind Pulliam Bluff.

[16] Length estimated, abdomen extended in specimen.

Head pinkish cinnamon, dorsal surface darker, sayal brown, with broad post-ocular bar of shining bister on each side. Antennae ferruginous. Pronotum with disk sayal brown; lateral lobes with the broad postocular band dorsad of blackish bister, which is shining to the principal sulcus, on the metazonal portion represented by a narrower suffused line of bister, remaining portions of lateral lobes pinkish cinnamon deepening to cinnamon on metazonal portion. Tegmina with dorsal field verona brown; lateral field warm sepia, showing a few minute flecks of verona brown. Abdomen cinnamon buff, with a shining blackish brown patch on each side before the cercal bases. Distal portion of cerci and immediate apex of subgenital plate suffused with bister. Cephalic and median limbs pinkish buff, weakly washed laterad with walnut brown. Caudal femora cinnamon buff, dorsal surface with a proximal fleck, two broad transverse bars and entire genicular areas warm sepia, external pagina with a broad longitudinal maculation of warm sepia, which sends a ray to the proximo-dorsal fleck, a very broad band toward the first dorsal band and, before this, after narrowing strongly, it sends a broad band toward the second dorsal band; ventral surface orange-cinnamon, with a row of black dots below the lower marginal carina of the external pagina. Caudal tibiae carnelian red, with a small proximal annulus of warm sepia, spines black, spurs buffy, black tipped.

Intensification and recession of color pattern causes the series to show decided diversity in superficial appearance.

In the maximum intensive condition (Florida Mountains), the head and pronotum, including the lateral lobes, are very dark, almost as dark as the very broad postocular bar, while that portion of the ventral surface of the caudal femora against which the tibiae fit is carnelian red.

In the maximum recessive condition (Sanderson), the general coloration is all much paler, the postocular bar very narrow and terminated at the principal sulcus, the caudal tibiae and ventral surface of the caudal femora primuline yellow, the sternum abdomen and remaining portions of the caudal femora amber yellow, except the dark areas of the external pagina of the caudal femora, which areas in the female are ribbed, this caused by the fact that the sutures of the imbrications are all pale.

This latter feature does not appear to occur in the male sex of the species, though it is shown to various weak degrees in all the paler females of the series. It is the normal condition in both sexes of *ponderosus*.

Specimens Examined: 69; 37 males, 27 females and 5 immature individuals.

Texas: Sanderson, Terrell County, VIII, 25, 1912, (Rehn and Hebard), 1 ♂, 1 ♀. Moss Well, Chisos Mountains, 4500 to 5000 feet, IX, 5 to 8, 1912, (Rehn and Hebard), 2 ♀, 2 ♂, 1 juv. ♂, *paratypes*. Canyon behind Pulliam Bluff, Chisos Mountains, 4600 to 5000 feet, IX, 7, 1912, (Rehn and Hebard), 13 ♂, 12 ♀, 1 juv. ♂, *paratypes*. Lost Mine Peak, Chisos Mountains, 5500 to 7500 feet, 8), IX, 6, 1912, (Rehn and Hebard), 19 ♂, 9 ♀, 1 juv. ♀, *type*, *allotype*, and *paratypes*. Livermore Peak, Davis Mountains, 8200 feet, VIII, 30, 1912, (Rehn and Hebard), 2 juv. ♂.

New Mexico: Dripping Spring, Organ Mountains, (J. Mendozas; T. D. Cockerell), 2 ♂, 1 ♀, [Mus. Comp. Zool. and Hebard Cln.]. Filmore Canyon, Organ Mountains, 5700 feet, IX, 9, (C. H. T. Townsend), 1 ♀, [U. S. N. M.]. Florida Mountains, (H. A. Pilsbry), 1 ♀, [A. N. S. P.].

In the Chisos Mountains the species was found in moderate numbers wherever scrub brush occurred. The steep northern slope of Lost Mine Peak, at from 5500 to 6500 feet, was the only place where individuals were very abundant. Immature individuals were frequent, though it was early September and the season well advanced. In the Davis Mountains, a few days earlier, occasional immature examples alone were encountered, in heavy weeds on the upper edges of meadow areas reaching up to 8200 feet on Livermore Peak.

At Sanderson one specimen was secured in low grasses and plants in the dry bed of a stream, while another was taken on the adjacent slopes at 2900 feet. This was the nearest approach to desert conditions in which the species was found.

Melanoplus tunicae[17] new species (Plate XVIII, Figs. 3 and 4.)

We place this species last in the Ponderosus Group, preceded by *M. ponderosus viola* (Thomas)[18] (plate XVIII, fig. 5). From that insect it differs in its slightly more slender form, average longer tegmina, usually somewhat more solid coloration and distinctive male cerci.

The species is apparently widely distributed over the lower Mississippi Valley, south and east of the known distribution of *p. viola*. Both these insects, however, are apparently very local, being found only in the scant undergrowth of lofty deciduous forests and particularly those growing on low flat ground. This fact probably explains the reason why the present large species has until now remained unknown. In the obscurity of its favorite environment it is difficult to locate, and often, when apparently very scarce, close and exhaustive search over limited but selected areas resulted in securing a fairly large series.

[17]The Tunica, a tribe of friendly Indians, are prominent in early French history of the lower Mississippi, in which region the present insect is found.

[18]Blatchley (Orth. N. E. Amer., p. 406, 1920) has considered *viola* "the short-winged form" of *M. ponderosus* Scudder. We find *viola* to be a geographic race of *ponderosus*, which is clearly defined over an extensive area of distribution. Various intermediate conditions between *ponderosus ponderosus* and *ponderosus viola* are found in all of Louisiana but the southeastern portion, and through the humid strip of eastern Texas.

The greatest degree of convergence in the Ponderosus Group toward the Querneus Group is shown by *tunicae*.

Type.—♂; Strickton, Rankin County, Mississippi. September 12, 1915. (M. Hebard.) [Hebard Collection, Type no. 564.]

Size large; form moderately robust, much as in *M. alabamae* here described, appreciably less robust than in *M. ponderosus viola*. Vertex slightly but distinctly narrower than in *p. viola*, interocular space very slightly wider than proximal antennal joint, the vertex weakly depressed to fastigio-facial angle, the frontal costa weakly depressed in vicinity of the median ocellus. Eye twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina moderately well developed on metazona, subobsolete except briefly cephalad on prozona, principal sulcus moderately deep, other transverse sulci weak; disk as in *M. cumera* here described, much as in *p. viola*, caudal margin similarly obtuse-angulate produced, with apex sharply rounded. Tegmina and wings somewhat reduced, failing to reach apex of supra-anal plate (in but one male of the series reaching the abdominal apex and in all showing reduction, though averaging longer than in *p. viola*). Prosternal spine rather elongate, subcylindrical, tapering rather suddenly distad to the rather sharply rounded apex. Furcula represented by two small, bluntly obtuse-angulate productions of the tergite. Supra-anal plate much as in *p. viola*, broadly shield-shaped, the lateral margins briefly convergent and weakly convex, thence weakly convergent and broadly convex to the apical portion, which is briefly produced and rounded; medio-longitudinal sulcus rather broad and deep in proximal two-thirds, thence rapidly becoming obsolete, the disto-lateral carinae indicated by small convexities which are longer than broad. Cerci proportionately decidedly smaller than in *p. viola*, very much smaller than in *p. ponderosus*, with dorsal apex much more sharply rounded than in those races. Cercus with margins of shaft weakly convergent in proximal half, thence diverging without angulation, so that the margins are broadly concave to the enlarged distal portion; distal portion formed by a lobe, directed dorsad and very weakly distad and not in-bent, its axis nearly vertical, this lobe a third broader than long, approximately as long as the basal width of the cercus, its margins converging distad to the rounded apex which, though broadly rounded, is much less so than in *p. viola* and very much less so than in *p. ponderosus*, the distal and ventro-distal margins of this lobe almost straight, thus forming two weakly defined angulations.[19] Subgenital plate rather broad, its dorsal free margins broadly concave laterad to the moderately broad, transverse, thickened and elevated meso-distal portion.

[19]In the series slight variation occurs, to a type in which these margins are broadly convex with the angulations obsolete. Occasional specimens have the dorsal apex of the cerci slightly narrower or broader than in the type, but none are comparable to the type developed in *p. viola*.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Agrees with male except as follows: Size larger; form more robust, though distinctly more slender than females of *p. viola*. Vertex broader, the vertex and frontal costa with depressed areas weaker. Eye nearly one and four-fifths as long as infra-ocular sulcus. Tegmina proportionately decidedly shorter, reaching to two-thirds of distance to apex of abdomen (normal condition in the series, rarely reaching three-quarters distance to apex of abdomen). Ovipositor valves moderately elongate, with distal curvature moderately decided (though apparently not as decided as in *ponderosus*).

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Length of caudal femur	Width of caudal femur
Memphis, Tennessee (2).....	24.9–27.2	6.1–6	3.6–3.8	15.7–13.2	15.7–16	3.7–3.8
Greenville, Mississippi (2)....	26.7–26.8	6–6.3	3.6–3.4	16–15.6	15.6–15.8	4–3.9
Strickton, Mississippi, *type*..	26.5	6.3	3.8	15.4	16.8	3.9
Strickton, Mississippi, *paratypes* (14)....	26.5–29	6.3–7.2	3.7–4	14.7–17.2	15.8–17.7	3.9–4.2
Hattiesburg, Mississippi (10).....	26.7–29.2	6–6.8	3.7–4	14.7–17.7	16–17.8	3.8–4.3
Natchez, Mississippi (9)...	25.7–28.4	6–6.7	3.5–4	14.2–16.1	15.5–16.8	4–4.1
Lafayette, Louisiana (5)....	26.3–28.3	6.2–6.9	3.8–3.7	14.6–15.8	16.3–17.1	3.9–4.1
♀						
Memphis, Tennessee (4).....	34.8–36	7.4–8	4.8–5	15.9–17.4	18.7–20.6	4.2–4.8
Greenville, Mississippi.....	36	8.3	5	19	20	4.8
Strickton, Mississippi, *allotype*.....	36	7.9	4.9	16.2	18.9	4.6
Strickton, Mississippi, *paratypes* (8)	34.3–36	7.1–7.8	4.7–4.9	15.9–16.9	18.7–20.6	4.7–4.8
Hattiesburg, Mississippi (11)	32.5–37.2	7.2–8.2	4.7–5	14–19.7	18–20.3	4.4–4.8
Natchez, Mississippi (8).	32–36.2	6.8–8.3	4.6–4.8	14.7–17.4	18.3–20.2	4–4.8
Lafayette, Louisiana (10)...	30.8–34.5	7–8	4.6–5	15.8–18	18.5–21	4.1–4.9

It is clear that the size differences and degree of tegminal and wing reduction is a matter of individual variation in the present species, showing no geographic correlation.

Head cinnamon-buff with a faintly greenish tinge; dorsal surface darker, bister, with a moderately broad postocular bar of shining blackish brown on each side, this bar narrowly margined dorsad with cinnamon-buff. Pronotum with disk bister, narrowly somewhat paler along lateral margins cephalad; lateral lobes dorsad with the broad postocular bar continued to the principal sulcus, paling in its ventral portion, with ventral margin irregular, remaining portions of lateral lobes tawny olive, paling ventrad. Tegmina with dorsal field pale, avellaneous; lateral field suffused with bone brown, with a number of darker solid flecks of bone brown. Ventral surface of thorax and all of abdomen olive-ocher, the abdomen with a very small suffusion of shining blackish brown, on each side before the cercal bases. Cerci and immediate apex of subgenital plate suffused with prout's brown. Cephalic and median limbs old gold, weakly suffused and obscurely flecked with brown. Caudal femora with dorsal surface cinnamon brown, with a proximal area, two bands and genicular areas of chestnut brown; external pagina with suffusions of dark chestnut brown on distal and median portions, these the continuation of the dorsal bands, the remaining areas buckthorn brown paling to antimony yellow along the ventral margin; ventro-external surface saccardo's olive, except for a pregenicular buffy area, with a series of blackish flecks bordering the carina forming the ventral boundary of the external pagina; ventro-internal surface and ventral portion of internal surface vinaceous-rufous, except for a pregenicular buffy area. Caudal tibiae brown proximad, with a small blackish area, followed by a broad buffy annulus, the remaining portions of the proximal half buffy, suffused with brown, this shading into carnelian red dorsad and internally and apricot buff externally in distal half; spines black, spurs buffy with black tips.

Intensification and recession of color is developed to a moderate degree. The palest specimens have the dark areas considerably weaker and more reduced, the postocular bar very weak on head and extremely narrow on lateral lobes of pronotum, the dorsal surface of the head, pronotum and tegmina tawny olive.

In the darkest specimens the pale and dark areas of the caudal femora are much more contrastingly colored and clearly defined. In the series at hand occasional specimens have the dorsal field of the tegmina supplied with a few dark flecks, but the species may be said to average more solidly colored, with less flecking and mottling, than *p. viola*.

Specimens Examined: 87; 43 males, 43 females and 1 immature individual.

Tennessee: Memphis, IX, 16, 1915, (Hebard), 2 ♂, 4 ♂.

Mississippi: Greenville, IX, 14, 1915, (Hebard), 2 ♀, 1 ♂. Strickton, IX, 12, 1915, (Hebard), 15 ♂, 9 ♀, *type*, *allotype* and *paratypes*. Hattiesburg, IX, 11, 1915, (Rehn and Hebard), 10 ♂, 11 ♀. Natchez, IX, 13 and 14, 1915, (Rehn), 9 ♂, 8 ♀.

Louisiana: Lafayette, VIII, 9, 1915, (Rehn and Hebard), 5 ♂, 10 ♀, 1 juv. ♀.

At Memphis the species was very scarce in patches of lush weedy plants in a heavy deciduous swamp forest, while two specimens were found after long search in the undergrowth of a heavy upland deciduous forest, which undergrowth was composed of many low shoots and a little coarse grass. At Greenville it was found in the undergrowth of a bayou forest. At Strickton it was generally distributed through a dense river-swamp deciduous forest, where the ground was generally bare but with few weedy plants and areas of coarse swamp grass, and it was even more frequently encountered in a short-leaf pine and oak forest on slightly higher ground, in undergrowth composed of ferns, grape and other vines, cane and a variety of plants. At Hattiesburg the series was taken in the deep shade of a high and heavy deciduous forest, where the scanty undergrowth was composed of partridge-berry and some grape and raspberry vines.[20]

At Natchez the species occurred in moderate numbers in a heavy deciduous forest, among tangles of raspberry and ground vines, at the base of the slopes of a ravine in the bluff formation. At Lafayette it was found in undergrowth composed of swamp grasses and low plants, weeds and vines of a tall open forest of tupelo, oaks and cypress near a bayou, and also in the rather scanty undergrowth of the heavy deciduous bayou forest.

Melanoplus alabamae new species (Plate XVIII figs. 6 and 7.)

This handsome grasshopper is a member of the Querneus Group and is very closely related to *M. querneus* Rehn and Hebard,[21] differing apparently in the slightly smaller size and slightly more slender form, but strikingly in the shape of the male cerci.

[20]One female contained ninety-three gordius worms, each about two inches long; another five such worms, each about three inches long. We believe the infestation of the first specimen to be the maximum recorded for an Orthopterous insect.

[21]At the time *querneus* was described the species belonging to this group were referred to the "Fasciatus Group" by Rehn and Hebard (Proc. Acad. Nat. Sci., Phila., 1916, p. 231.). From our present knowledge of the species of *Melanoplus* we find that assignment to be incorrect, *fasciatus* (F. Walker) being a type more closely related to the phylum to which *borealis* (Fieber) belongs.

The male cerci show some convergence toward the type developed in *M. clypeatus* (Scudder), a species which belongs, however, to the distinct Clypeatus Group. These two groups include species showing many features of similarity; the members of the Clypeatus Group are, however, all decidedly larger and develop a distinctive color pattern of the caudal femora.

Type.—♂; Evergreen, Conecuh County, Alabama. August 4, 1915. (M. Hebard.) [Hebard Collection, Type no. 561.]

Size large, form moderately robust. Vertex and frontal costa below median ocellus shallowly depressed; interocular space narrow, slightly wider than proximal antennal joint. Eye slightly less than twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina well developed on metazona, obsolete on mesozona, weak on prozona (varying in the series to percurrent, weak on prozona and mesozona and cut only by the principal sulcus), transverse sulci distinct; disk with lateral margins very feebly diverging caudad, almost subparallel, caudal margin broadly obtuse-angulate produced with apex rather broadly rounded. Tegmina semi-reduced, twice as long as median femur (varying to distinctly less than twice that length in the series), subacuminate, the apices narrowly rounded, sutural margins very weakly convex. Prosternal spine elongate cylindro-conical, with apex rather sharply rounded. Furcula merely the briefest of points projecting from the penultimate tergite, poorly indicated on the surface of the tergite as broad, feebly convex areas, between which the tergite is divided by a medio-longitudinal suture. Supra-anal plate broad shield-shaped, lateral portions longitudinally broadly concave, medio-longitudinal carina deep and narrow in proximal half (varying in one paratype to shallow and poorly defined), at end of which it is terminated by a low but sharp transverse carina which curves cephalad in its median section and caudad in its meso-lateral sections, in the distal half of the plate the disto-lateral carinae are distinct and parallel (in one paratype weakly convergent caudad) to proximal portion of this section. Cerci broad, the greatest distal width about three-quarters the length, very broad at base, narrowing very slightly to middle, the ventral margin moderately concave, the dorsal margin broadly angulato-concave with distal half straight, disto-ventral angle acute rectangulate, disto-dorsal section produced disto-dorsad, very broadly convex, this rounding weakly into the moderately oblique and almost straight distal margin; external surface of cereus showing a very feeble convexity, the axis of the cereus showing a weak inward curvature. Subgenital plate full, broad, proximo-lateral depth equal to median depth, free margin semi-elliptical in dorsal aspect; when seen from the side the lateral portions are broadly concave to the slightly produced blunted median section.[22]

[22] The degree of production of this extremity is seen to be slightly variable, as is also true of *quercus* in the series of that species now before us.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Length of caudal femur	Width of caudal femur
Evergreen, Alabama, *type*....	25.5	5.9	3.3	10.8	14.4	3.7
Evergreen, Alabama, *paratype*.....	23	5.7	3.2	9.8	14	3.6
Evergreen, Alabama, *paratype*.....	25.3	6	3.4	10.3	15	3.8
Greenville, Alabama, *paratype*.....	25	6	3.3	12	14	3.6

Head shining except dorsal portion, saccardo's umber becoming darker on genae, dorsal surface rich warm sepia, postocular bars blackish mummy brown, bordered dorsad by a very narrow buffy line. Antennae ochraceous-tawny, deepening to russet distad. Pronotum with disk rich warm sepia, lateral lobes shining except on metazonal portion, snuff brown deepening dorsad to blackish mummy brown, the postocular bars weakly defined except as a marginal line which in the prozonal portion, as on the head, is bordered dorsad by a very narrow buffy line. Tegmina with dorsal field light pinkish cinnamon, lightly suffused proximad and with a few flecks along sutural margin of mummy brown, lateral field mummy brown flecked with blackish, fading to buffy in the apical portion. Abdomen dorsad warm sepia, ventrad yellow ocher. Cephalic and median limbs mottled saccardo's umber. Caudal femoral marking strikingly characteristic of the species of this group, the dark bands spreading over the external surface so that three pale areas are blocked off, the proximo-dorsal of these elongate oval and broken by the characteristic small dark suffusion of the dorsal surface, the proximo-ventral area broader and elongate oval, the third of these situated beyond the median point and forming a broad transverse band, these areas well defined, clay color paling ventrad, except the dorso-proximal which is sayal brown, the remaining portions of the dorsal and external surfaces mummy brown; internal surface ochraceous-buff with two brown suffusions dorsad; ventral surface apricot orange, shading to ochraceous-buff distad and narrowly in external section. Caudal tibiae carnelian red, deepening mesoproximad to a suffusion of liver brown before the proximal section, which is light ochraceous-salmon internally, suffused very weakly with liver brown externally; spines black, spurs buffy with tips black.

[23] In addition to this material, a female belonging to the present group, from Brookhaven, Mississippi, is before us. This specimen was taken by Rehn on September 15, 1915, in grass in a forest of second-growth oak and shortleaf pine. As we have no males of this group from west of the above localities, we are unable to determine this specimen at the present time, although it is unquestionably a representative of the present or a very closely related species.

Specimens Examined: 13; 4 males and 9 immature individuals.

ALABAMA: Greenville, Butler County, VIII, 3, 1915, (Hebard), 1 ♂, *paratype*, 2 juv. ♂, 6 juv. ♀. Evergreen, Conecuh County, VIII, 4, 1915, (Hebard), 3 ♂, *type* and *paratypes*, 1 juv. ♀.

At Greenville the species was found, particularly about vine tangles, in the rather scanty undergrowth of a lofty forest composed chiefly of pine and sweet-gum. At Evergreen it was found to be very scarce in a heavy forest of magnolia, sweet gum and some holly and tulip trees, where the low ground was almost bare of vegetation but covered with leaf litter.

Like *quercus* this species is doubtless local in distribution, but at the proper season should be found in fair sized colonies in the scanty undergrowth of the forests.

Melanoplus platycercus new species (Plate XVII, figs. 2, 3 and 4.)

This species is closely related to the variable *M. rileyanus* Scudder. In the male sex it may be readily separated by the much shorter and broader cerci, in which the length approximates the greatest width, as well as by the shorter subgenital plate, which has the free margin almost evenly semicircular in dorsal aspect. Females of *platycercus* average smaller and more slender, but can not be separated from a few of the specimens of the large series of *rileyanus* now before us.

Type.—♂; Lone Pine Canyon, Sierra Nevada Mountains, Inyo County, California. Elevation, 8000 to 8371 feet. September 5 and 8, 1919. (Rehn and Hebard). [Hebard Collection, Type no. 559.]

Size small, as small as the smallest examples of *rileyanus* before us; form medium. Vertex rather narrowly sulcate, frontal costa shallowly concave at and below the median ocellus, its lateral margins subcarinate,. Eye slightly over twice as long as infra-ocular sulcus. Pronotum moderately elongate, the disk widening very weakly caudad, medio-longitudinal carina distinct on metazona, weak elsewhere, sulci distinct but delicate, caudal margin of disk very weakly obtuse-angulate produced. Prosternal spine blunt conical (varying in the series to heavy, transverse, with apex very blunt). Tegmina considerably shorter than pronotum, ovate, rather broadly rounded distad, separated by a very brief interval. Furcula represented by a pair of slender, parallel, straight projections, which taper to their blunt apices, in total length equalling about one-quarter that of the supra-anal plate. Supra-anal plate slightly longer than wide, triangular, the lateral

margins showing very faint convexity, medio-longitudinal sulcus deep in proximal third, weak beyond, lateral portions of plate with surface rather strongly but broadly concave, disto-lateral carinae stout, parallel, about twice as long as broad, their distal extremities causing the lateral margins to project slightly at the point of juncture on each side. Cerci very broad, greatest breadth almost equal to length, due to the production ventrad of the proximal section; dorsal margin straight to the rounded apex, ventral margin rather strongly convex, this becoming more decided toward end of proximal three-fifths, thence very feebly convex to the apex, in this way an obtuse-angulate emargination is formed at the end of the proximal three-fifths; proximal portion of cercus with surface deplanate, vertical distal portion bent inward, with surface broadly and transversely concave (not longitudinally and deeply concave as in typical *rileyanus*). Subgenital plate with free margin in dorsal aspect of equal convexity throughout, showing sub obsolete bituberculation mesad (weak to obsolete in the series), on each side of which the margin shows feeble concavity for a brief distance.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Agrees with type except in the following respects. Size larger, form rather slender (for females of the majority of the species of the brachypterous Melanopli). Sulci of vertex and frontal costa weaker and broader. Eye about twice as long as infra-ocular sulcus. Pronotum with sulci and carina even less decided, the lateral margins of the disk showing no greater divergence caudad. Ovipositor valves with apices moderately curved.

Measurements (in millimeters) of extremes

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
♂						
Type.....	14.2	3.5	1.9	2.8	1.9	9
Paratypes (13)..	14.2–15.8	3.3–3.6	1.9–2	2.7–2.9	1.8–2	8.6–9.2
♀						
Allotype.....	19.5	3.9	2.6	3.1	2.1	10.1
Paratypes (15)..	18.5–22.5	3.8–4	2.4–2.7	3.1–3.4	2–2.3	9.8–11

Head avellaneous, dorsal surface suffused wood brown, with rather broad postocular bars of shining blackish brown on each side. Pronotum with disk suffused wood brown; lateral lobes with a rather broad dorsal band of shining blackish brown, which in the metazonal section is dull and paler, bone brown, remaining ventral portions of lateral lobes vinaceous-fawn. Tegmina with narrow dorsal section avellaneous, lateral section somewhat glossy bone brown. Abdomen dorsad cinnamon-buff, the proximal tergites marked heavily laterad with sharply defined areas of shining blackish brown. Ventral surface chamois, shading to cream buff distad on abdomen, slightly suffused with fawn color on sternum. Cephalic and median limbs fawn color, somewhat mottled. Caudal femora cinnamon-buff suffused with army brown, dorsal surface with a proximal area and two bands of bone brown,

external surface with the characteristic Melanoplid picturing of this color weakly developed. Caudal tibiae medici blue, fading to buffy proximad, with a small and weak proximal dark annulus; spines black and spurs buffy, black tipped.

The series shows little color variation. Some individuals are of a slightly more buffy general tone of coloration, others slightly more grayish.

Specimens Examined: 30; 14 males and 16 females.

California: Lone Pine Canyon, Sierra Nevada Mountains, Inyo County, 8000 to 8371 feet, IX, 5 and 8, 1919, (Rehn and Hebard), 14 ♂, 16 ♀, *type*, *allotype* and *paratypes*.

This species was found in open areas of the pine forest, on bare soil of decomposed granite, where sage brush occurred in small quantities and scanty grasses were found. Difficult to locate and occurring in small colonies, the insect was found to be an active and powerful jumper. It was first seen, but not taken, in Lone Pine Canyon at an elevation of about 7500 feet.

Melanoplus rehni[24] new species (Plate XVI, fig. 8; plate XVII, fig. 5.)

This handsome species is related to *M. usitatus* Scudder. Males differ in the much more extensive shining black area of the pronotal lateral lobes, the slightly greater production and angulation of the caudal margin of the pronotal disk and the more elongate supra-anal plate and cerci, which latter are furthermore not decidedly narrowed distad.

Both sexes differ in the proportionately slightly longer pronotum. The majority of the females have the lateral lobes of the pronotum with a broad dark band, this band solid and broadening caudad; a few, however, lack this marking. In *usitatus* females have traces of such a marking, but these are irregular in ventral outline and are narrower in the metazonal than in the prozonal portion.

The species of this group all have the head unusually large in proportion to the body bulk. This is particularly apparent in *rehni*.

Type.—♂; Glendale, Douglas County, Oregon. Elevation, 1500 to 1900 feet. August 12, 1909. (Rehn and Hebard.) [Hebard Collection, Type no. 558.]

Size large for the group, medium for the genus; form medium for the group. Vertex little produced, sulcation rather broad and not deep, though more decided than in *usitatus*, frontal costa shallowly concave from above

[24]In honor of our friend and co-worker Mr. James A. G. Rehn, the high standard of whose Orthopterological studies requires no comment.

to below median ocellus; lateral carinae of vertex and frontal costa showing appreciable convergence at fastigio-facial angle. Eye about one and three-fifths times as long as infra-ocular sulcus. Pronotum elongate, the disk showing feeble constriction in the prozonal portion, the lateral margins scarcely divergent on metazona; transverse sulci distinct, medio-longitudinal carina very weak except on metazona, not distinct on prozona as in *usitatus,* caudal margin of pronotal disk weakly obtuse-angulate produced, not weakly and broadly convex, subtruncate or feebly emarginate as in *usitatus.* Prosternal spine blunt conical. Tegmina shorter than pronotum, separated by a brief interval (slightly overlapping in the series from Siskiyou), ovate with apices rounded. Furcula represented by two minute points. Supra-anal plate slightly longer than wide (in the Siskiyou series averaging distinctly longer than wide, in *usitatus* frequently distinctly wider than long), surface weakly specialized, medio-longitudinal sulcus shallowly developed in proximal two-fifths, the lateral portions of the plate rather strongly concave, the lateral margins showing a trace of thickening opposite the cerci, the distal surface raised in the portion between the subobsolete disto-lateral carinae. Cerci heavy, somewhat over twice as long as basal width, dorsal and ventral margins weakly convergent to distal two-fifths, where the distal portion is bent upward, the margins there subparallel until the curve into the broadly rounded apex is reached, external surface of this distal portion shallowly concave. Subgenital plate conical, tapering to a distinct meso-dorsal tubercle, which is very feebly raised above the other portions of the free margin.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following characters. Size much larger, form more robust. Sulci of vertex and frontal costa weaker and broader. Eye about one and one-third times as long as infra-ocular sulcus. Pronotum with sulci and carina weaker, lateral margins of disk more divergent caudad, but not as much so as is usual in this sex of *usitatus.* Ovipositor valves slightly longer than in *usitatus,* with apices similarly decidedly curved.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Glendale, Oregon, *type*	18.5	4.8	2.7	4.1	2.5	10.8
Glendale, Oregon, *paratypes* (8)	18–19.5	4.6–4.8	2.7–2.8	3.7–4.7	2.5–2.7	10.4–11
Siskiyou, Oregon, (7)	17.5–19.3	4–4.7	2.5–2.7	4–4.3	2.6–2.8	10.7–11
♀						
Glendale, Oregon, *allotype*	29.5	6	4.1	5.2	3.4	13.2
Glendale, Oregon, *paratypes* (6)	26.5–28	5.2–5.8	3.7–4	4.9–5.7	3.2–3.3	12.2–13.8
Siskiyou, Oregon, (6)	23.7–28	5.2–5.7	3.9–4	5–5.8	3.4–3.9	12.8–13.7

Coloration.—Type. Head pinkish buff, with a very broad shining postocular band on each side, occiput bister paling to tawny-olive laterad and mesocephalad. Antennae clay color, becoming sayal brown distad. Pronotum with disk bister, paling narrowly to tawny-olive on each side of prozona; lateral lobes shining dark chestnut brown, narrowly margined ventro-cephalad and more broadly ventrad with cinnamon-buff, the dark marking paling slightly to warm sepia on caudal portion of metazonal section. Tegmina bister. Abdomen dorsad cinnamon-buff, with a broad and sharply defined band on each side of shining blackish chestnut brown, which narrows caudad, terminating at the cercal bases. Distal portion of cerci and lateral portions of subgenital plate of this color, running more narrowly around the free margin of the latter. Underparts warm buff. Cephalic and median limbs clay color. Caudal femora externally snuff brown, deepening to bister distad, the dorsal surface with two darker subobsolete transverse bands, ventral surface ochraceous-buff proximad, in remaining portions ochraceous-salmon, with a pregenicular annulus of warm buff. Caudal tibiae dark bluish glaucous, fading proximad to whitish with a weakly defined brown annulus; spines black.

The allotype is similarly but less contrastingly colored, except that the lateral lobes of the pronotum are differently marked, showing dorsad a band of shining bister which broadens caudad to the principal sulcus, there being about two-fifths as deep as the lateral lobe, the metazonal portion entirely verona brown. In the paratypic series little color variation is shown, some specimens being slightly more reddish than others and the intensity of the markings differing individually to a slight degree.

The Siskiyou series is much darker. In these the males have no pale margin of the lateral lobes of the pronotum, while the occiput, disk of pronotum and tegmina are solidly bister, the ventral surface of the caudal femora hay's russet and other portions correspondingly darkened. In the females of this series some have the occiput, disk and lateral lobes of pronotum and tegmina vandyke brown, with color pattern generally obscured. One specimen shows, however, a strongly recessive type, being generally ochraceous-tawny, the pronotum entirely of this color, with only a trace of postocular darkening on the head. In this specimen the caudal tibiae are glass green, becoming buffy proximad.

Specimens Examined: 29; 16 males and 13 females.

Oregon: Glendale, Douglas County, 1500 to 1900 feet, VIII. 12, 1909, (Rehn and Hebard), 9 ♂, 7 ♀, *type*, *allotype* and *paratypes*. Siskiyou, Jackson County, 4100 to 5800 feet, VIII. 13, 1909, (Rehn and Hebard), 7 ♂, 6 ♀.

At Glendale the species was found to be scarce and very active in small openings among the heavy growth of tall firs, in a valley of the Rogue River Mountains. At Siskiyou, on the steep forested slopes of the Siskiyou Mountains, it was found scarce in

the forest undergrowth from 4200 to 5600 feet, two females being secured in the Canadian Zone forest up to 5000 feet, the others in the alpine undergrowth of a forest of scattered pine and alpine hemlock, where an interdigitating flora of the Canadian and Hudsonian Zones occurred.

Melanoplus oreophilus new species (Plate XVII, figs. 6 and 7.)

This species is very closely related to *M. montanus* (Thomas) and *M. washingtonianus* (Bruner), showing nearer affinity to the latter.

Compared with these species, it is found to differ in both sexes in the average darker coloration, less sharply defined color pattern and deep pink coloration of the ventral and internal faces of the caudal femora. Occasional individuals of *oreophilus*, however, have the color pattern more intensive. The tegmina average narrower in *washingtonianus* and *oreophilus* than in *montanus*, in which latter species they are usually broad lanceolate.

The male genitalia are distinctive. In *oreophilus* the cerci are distinctly more slender and show a slight expansion distad, the margins there being weakly convex and giving to the apices of the cerci a weakly spatulate contour, not shown in either *montanus* or *washingtonianus*. The male subgenital plate is more drawn out, with apical tubercle slightly more sharply rounded than in *washingtonianus*. In *montanus* this tubercle is usually obsolete, rarely bluntly indicated.

Type.—♂; Cloud Cap Trail, Mount Hood, Oregon. Elevation, 6000 to 7000 feet. August 18 to 20, 1910. (Rehn and Hebard.) [Hebard Collection, Type no. 559.]

Size medium, form moderately robust. Vertex narrower than in *washingtonianus*,[25] surface shallowly depressed between the distinct lateral carinae; frontal costa weakly depressed in vicinity of median ocellus. Eye about one and one-half times as long as infra-ocular sulcus. Pronotum much as in *washingtonianus*, medio-longitudinal carina weak on metazona, very weak on prozona (frequently obsolete between the sulci); transverse sulci weak, caudal margin of disk weakly obtuse-angulate produced with angle broadly rounded. Prosternal spine rather sharply conical (varying in the series to blunt conical).[25] Tegmina as in *washingtonianus*, slightly longer than prono-

[25]This is an unreliable character, as the series shows variation in this feature to a condition in which it is as wide as in *washingtonianus*.

[26]In *montanus* we find the prosternal spine to vary from very blunt and distinctly transverse to blunt conical. It is clear that this process is subject to decided variation in the group to which these species belong.

tum, overlapping (varying from subattingent to strongly overlapping in the series), lanceolate pads. Furcula represented by two small stout processes, springing from convexities of the tergite, the projecting portions about twice as long as broad with apices rounded. Supra-anal plate shield-shaped, somewhat triangulate, surface little specialized, medio-longitudinal sulcus percurrent but deep only in proximal two-thirds, lateral portions of plate shallowly concave, disto-lateral carinae feebly indicated as nearly parallel, low ridges, about twice as long as broad. Cerci distinctly over three times as long as proximal width (varying in the series to three times as long as proximal width), slender, ventral margin almost straight to apical portion where a slight convexity occurs, dorsal margin broadly concave in proximal three-fifths, broadly convex in distal two-fifths to the broadly convex distal margin, the apical portion of the cercus in consequence intermediate in width between the basal and median portions and subspatulate in outline (occasionally specimens show this distal spatulation reduced, the distal width being but very slightly greater than the median width; none show the cercus as broad, with apex as truncate as in *washingtonianus*). Subgenital plate appreciably, though only slightly, narrower than in *washingtonianus*, the sides converging to the rather sharply rounded apex, which projects dorso-caudad above the free disto-lateral margins of the plate.

Allotype.— ♀; same data as type. [Hebard Collection.]

Agrees with type except in the following features. Size much larger, form much more robust. Vertex broader, similarly shallowly depressed but with lateral carinae weak. Eye one and one-third times as long as infra-ocular sulcus. Prosternal spine heavy, conical, with apex (normally) rather sharply rounded. Ovipositor valves moderately elongate, with distal curvature decided.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Mount Hood, Oregon, *type*	17.5	4	2.3	5	2.6	10.2
Mount Hood, Oregon, *paratypes*, (103)	15.8–19	3.8–4.9	2.1–2.6	4.1–6	2–3	9.4–11.4
Blue Mountains, Oregon, (8)	17.2–19	4–4.3	2.6–2.4	4.7–6	2.3–2.5	10–10.3
♀						
Mount Hood, Oregon, *allotype*	25	5.3	3.7	7.1	3.3	12.8
Mount Hood, Oregon, *paratypes* (113)	19.5–27	4.9–5.8	3–3.9	4.9–7.6	2.3–3.5	11.4–13.6
Mount Hood, Oregon, 3290 feet	26.8	5.4	3.6	7.2	3.3	13.3
Blue Mountains, Oregon, (5)	23.8–26	4.8–5	3.3–3.5	5.3–6.5	2.9–3	11.8–12

The minimum extremes of size variation in the very large paratypic series before us, from the Hudsonian Zone on Mount Hood, are amplified by the presence of a few exceptionally small individuals, showing decided stunting, probably a result of the severe conditions under which their development had taken place.

Head deep olive buff, a broad postocular bar on each side of dark blackish olive, occiput and vertex olive brown. Antennae pecan brown, becoming darker distad. Pronotum with disk olive brown, shading to natal brown on metazona, lateral lobes with a shining band of bone brown dorsad which is narrow proximad, about two-fifths as wide as the lateral lobe at principal sulcus, caudad of this sulcus indicated by a dull suffusion of bone brown, remaining portions of lateral lobes deep olive buff showing a few flecks of brown. Tegmina bister with a few irregular blackish flecks, paling narrowly along the sutural margin and at apex to buff. Dorsal surface of abdomen tawny olive microscopically flecked with darker and with large irregular patches of blackish brown laterad on the proximal tergites. Ventral surface chamois. Cephalic and median limbs clay color washed with grayish and olivaceous. Caudal femora clay color with a grayish tinge, dorsal surface with two weakly defined irregular bars of brown, external face with the characteristic Melanoplid picturing defined in irregular areas of dark brown, the carinae margining the external pagina flecked with brown, these markings the more conspicuous on the ventral carina, which is of a paler buffy coloration; ventral surface and all but dorsal portion of internal surface jasper red, this sometimes confined to the internal half of the ventral surface. Caudal tibiae jasper red with a proximo-internal dark marking; spines black, spurs buffy, black tipped.

In females the tegmina and dorsal surface of the abdomen usually show numerous flecks of dark brown, while the latero-proximal dark areas on the latter are often much broken.

The general facies is distinctive, but plainly closer to that of *washingtonianus* than to that of *montanus*.

Specimens Examined: 232; 113 males, 118 females and 1 immature individual.

Oregon: Washington Gulch, foothills of Elkhorn Range, Blue Mountains, 3800 to 4300 feet, VIII, 14, 1910, (Rehn and Hebard), 8 ♂, 3 ♀. Cloud Cap Turnaround, north slope of Mount Hood, 3290 feet, VIII, 20, 1910, (Hebard), 1 ♀. Cloud Cap Trail, Mount Hood, 6000 to 7000 feet, VIII, 18 to 20, 1910, (Rehn and Hebard), 104 ♂, 113 ♀, *type*, *allotype* and *paratypes*, 1 juv.; VIII, 18, 1916, (G. P. Englehardt), 1 ♂, 1 ♀, *paratypes*, [Hebard Cln.].

In the Blue Mountains this insect was found scarce, one colony being located on the steep pine-clad hillsides among scant undergrowth, in which *Spiraea petufolia* was predominant.

On Mount Hood, in the Hudsonian Zone, the species was very abundant on the open slopes covered with rich green grasses

above the fir forests and on the ridges. It was also found generally distributed but in small numbers at the foot of a glacier, in wet spots covered with green flowering plants and just above timber line on ground covered with volcanic ash in which scattered and thin dry grasses grew.

After dark individuals could be found in the dew-covered grasses, scarcely able to move, their bodies ice cold.

Melanoplus calapooyae[27] new species (Plate XVII, fig. 8; plate XVIII, fig. 8.)

Scudder unfortunately included under his *Melanoplus validus* material referable to this species.

The present species is clearly the optimum development in the Saltator Group, both as to size and specialization. Nearest relationship is shown to *M. validus* Scudder, which species occurs in southern Oregon. This is shown by the male cerci, which are of a similar type, though having reached a higher degree of specialization.

From Scudder's species *calapooyae* further differs in the larger size, more robust form, male supra-anal plate with distal narrowing portion fully as long as the proximal portion and color of male caudal tibiae, which are yellowish with a pink tinge.

In the form of the male supra-anal plate nearest agreement is with the Shastan *M. ascensus* Scudder, this plate in the present species being only slightly more elongate, with disto-lateral sculpturing heavier.

Type.—♂; Divide, Calapooia Mountains, Lane County, Oregon. Elevation, 1400 to 1600 feet. August 11, 1909. (Rehn and Hebard.) [Hebard Collection, Type no. 557.]

Size large, form robust for the group. Vertex and frontal costa as in *validus*, much as here described for *M. bernardinae*. Eye slightly less than twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina distinct on metazona, subobsolete on prozona (in the series varying from obsolete to weakly defined in this section); sulci distinct, the principal sulcus deep; caudal margin of disk weakly obtuse-angulate produced. Prosternal spine rather elongate, slender, tapering very weakly to the bluntly rounded apex. Tegmina very slightly longer than pronotum, moderately overlapping, broad lanceolate, with apices rather sharply rounded. Furcula

[27]The Calapooya Indians once inhabited the mountains which bear their name and from which the present species is known.

subobsolete, represented by minute points on the margin of the penultimate tergite, which are not as long as broad. Supra-anal plate triangulate shield-shaped, the lateral margins straight, strongly raised and almost parallel in proximal half, straight and convergent to sharp apex in distal half; surface of plate showing a shallow percurrent medio-longitudinal sulcus, in proximal half bordered by low ridges which are flanked by deep concavities caused by the raised lateral margins, distal half with two decided marginal carinae, running from the lateral angles to the apex of the plate and broadly convex to the lateral margins, so that on each side the distal portions of the cerci fit into the intervening space. Cerci heavy, three times as long as basal width, curving inward distad so that the apices, extending beyond the apex of the supra-anal plate, fit in snugly beside the apices of the paired plates beneath the supra-anal plate; ventral margin broadly concave to the produced apex, dorsal margin more broadly concave to dorsal extremity, beyond which the distal margin of the cercus is rather gently oblique and almost straight to the produced apex, least width of shaft three-quarters proximal width, greatest width of distal portion distinctly greater than proximal width; distal portion with angles rounded and lamellate toward the distal margin. The cercus is heavier, with more decided distal expansion and lamellation and much greater production of the apex, which is situated ventrad, than in *validus*. Subgenital plate with a distinct median production of the free margin, this margin somewhat thickened latero-proximad and in the rather broadly transverse produced portion.

Allotype—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following characters. Size larger, form more robust. Sulcation of vertex and frontal costa weaker and broader. Eye about one and two-thirds times as long as infra-ocular sulcus. Prosternal spine heavier. Ovipositor valves rather strongly curved.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Divide, Oregon, *type*	22.5	5	3.1	5.3	2.9	11.2
Divide, Oregon, *paratypes* (76)	19.8–25	4.5–5.2	2.7–3.1	4.1–5.9	2.8–3.1	11–12.6
Drain, Oregon, (2)	20.7–23	5–5.1	2.8–3	5.2–5.6	2.9–3	11.8–12
♀						
Divide, Oregon, *allotype*	25.8	5.9	3.9	5.9	3.5	13.8
Divide, Oregon, *paratypes* (67)	20.7–27	4.3–6.2	3.3–4.3	5–6.7	2.9–4	10.9–15
Drain, Oregon	23.2	5.7	3.7	5.1	3.1	12.8

In this species the tegmina are found to overlap slightly in the majority of specimens, they are attingent in some and are separated by a slight to a moderate interspace (maximum 1.2 mm.) in a few individuals, particularly among the females. The tegminal size is decidedly variable; in the great majority of specimens they are broadly lanceolate, in rare examples broadly oval.

The furcula are normally so little developed in this species that we are not surprised to find frequent males entirely lacking these processes.

Coloration.—Type. Head orange-cinnamon, vertex deep russet, postocular blackish bars not wide and narrowly margined dorsad with buffy. Pronotum with disk russet, deepening to mars brown laterad, lateral lobes buffy suffused with tawny, except for an irregular shining blackish brown bar dorsad which deepens caudad, terminated at the principal sulcus and there occupying two-fifths the depth of the lateral lobe; metazonal portion deepens to mars brown dorsad. Tegmina mars brown with a very few darker flecks. Abdomen ochraceous-tawny heavily suffused with blackish proximo-laterad, a small area before bases of cerci on eighth tergite and tips of cerci blackish. Cephalic and median limbs tawny, slightly suffused. Caudal femora tawny with the trivittate marking, characteristic of many of the Melanopli, showing in blackish brown, but much blurred; ventral surface tawny. Ventral surface of insect and caudal tibiae cinnamon-buff, the spines of the latter black tipped.

In the female sex the coloration is similar, usually of a somewhat less reddish tone, the markings of the caudal femora not as dark and the caudal tibiae coral pink.

In the maximum recessive coloration the insects are ochraceous-tawny, the tegmina slightly darker, the postocular bars and other darker markings obsolete.

It is of interest to note that males or females of at least some of the species of this group may show pink or bluish caudal tibiae.

Specimens Examined: 149; 79 males, 69 females and 1 immature individual.

Oregon: Divide, Calapooia Mountains, Lane County, 800 to 1600 feet, VIII, 10 and 11, 1909, (Rehn and Hebard), 76 ♂, 67 ♀ 1 juv. ♀, *type*, *allotype* and *paratypes;* IX, 12, 1897, (A. P. Morse), 1 ♀, *paratype* of *M. validus* Scudder, [Hebard Cln.]. Drain, Douglas County, 300 to 350 feet, VIII, 11, 1909, (Rehn and Hebard), 3 ♂, 1 ♀.

At Divide the species was generally distributed and very common both in the grassy valley and on hillsides covered with a scattering growth of scrub oaks. At an elevation of 800 feet, however, it was particularly plentiful in a brulé, among dead pine boughs and tops. At Drain it was rare on hillsides of short, dry, yellow grass.

Melanoplus bernardinae new species (Plate XVII, figs 9 and 10)

This species is an aberrant member of the Saltator Group, and the smallest of the species there included. It shows no close relationships, and only a weakly defined development of the type of male supra-anal plate which is so distinctive a feature in males of the other species of the group.

The small size of the insect and brilliant coloration of its caudal limbs constitute striking features.

Type.—♂; Vivian Creek, San Bernardino Mountains, Riverside County, California. Elevation, 7200 feet. August 29, 1919. (Rehn and Hebard.) [Hebard Collection, Type no. 554.]

Size small for the genus, form slightly more slender than the other species of the Saltator Group. Vertex little produced, sulcation narrow and lateral carinae rather strongly developed, frontal costa with surface weakly concave from median ocellus ventrad, lateral margins slightly raised to fastigio-facial angle. Eye large, over twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina distinct though not strongly developed, except between the principal and median sulci; sulci distinct, the principal sulcus deep; caudal margin of disk broadly obtuse-angulate produced. Prosternal spine longer than broad, moderately transverse, the sides showing little convergence to the bluntly rounded apex. Tegmina slightly shorter than pronotum (in the series varying to slightly longer than that dimension), slightly overlapping (varying to attingent in the series), broad oval, rounding distad but showing a slight angulation at the immediate apex. Furcula represented by two minute rounded projections no longer than broad. Supra-anal plate triangulate shield-shaped, the lateral margins moderately raised, straight and weakly convergent in proximal half, thence deplanate, straight and more strongly convergent to the sharply rounded apex; medio-longitudinal sulcus and margining carinae equally pronounced and occupying proximal three-fifths of plate, the lateral portions of the plate there moderately concave, disto-lateral carinae more lateral than usual in position, converging and blending distad with the lateral margins, thus rounded depressed areas beyond the raised portions of the lateral margins of the plate are formed, upon which rest the apices of the cerci. Cerci less than twice as long as basal width, bent weakly inward in distal third, with external surface weakly convex except along the ventral margin, where a weak linear depression occurs; ventral margin almost straight, dorsal margin weakly and broadly concave to apex which is truncate, with angles rounded and distal margin showing feeble convexity, the dorsal angle appreciably the more produced and sharply rounded, the marginal contour such that the distal portion of the cercus is very slightly wider than the narrowest portion of the shaft. Subgenital plate with a weak median production of the free margin, due to a weak lateral concavity of that margin, the free margin thickened latero-proximad and in the briefly transverse produced portion.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following features. Size larger, form more robust. Sulcation of vertex and frontal costa weaker and broader. Eye twice as long as infra ocular sulcus. Pronotum with medio-longitudinal carina weaker on prozona. Tegmina similar (but showing more individual variation than in male sex, in the series very slightly overlapping to separated by a minute interval, individuals with the most elongate tegmina having these distinctly broad lanceolate in form). Prosternal spine blunter. Ovipositor valves short, with distal curvature decided.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Vivian Creek, California, *type*	14	3.2	2	3	2	7.9
Vivian Creek, California, *paratypes* (6)	13.5–15	3.1–3.7	2–2.3	2.9–3.7	1.7–2.1	7.9–8.1
High Creek, California, (3)	15–16	3.7–3.6	2.2–2.3	3.7–4	2–2.2	8.4–8.8
Santa Ana Canyon, California	14	3.5	2.1	3.7	2	8.3
San Jacinto Peak, California (5)	13.2–14.5	3.2–3.5	2–2.3	3–3.7	1.7–2	7.7–8.4
♀						
Vivian Creek, California, *allotype*	17	3.9	2.7	3.9	2.1	9.8
Vivian Creek, California, *paratypes* (34)	16.5–19.7	3.8–4.1	2.4–2.8	3.7–5	2.2–2.8	9.3–10
High Creek, California (13)	18.5–21.5	4.2–4.8	2.8–3.2	3.9–4.9	2.2–3	10–11.6
South Fork of Santa Ana River, California	16.5	4.7	2.9	4.9	2.9	11
San Jacinto Peak, California (4)	19.5–20	4.3–4.6	3–3.2	4.8–5.4	2.7–2.9	10.6–9.8

It is of interest to note that, on the slopes of San Gorgonio Peak, the individuals taken at 7200 feet (Vivian Creek) average smaller than those taken at 9000 feet (High Creek). In the great majority of species of Orthoptera studied we have found size decreasing with an increase in altitude, if elevation showed any influence on the size of the individual.

Coloration. Head buckthorn brown, occiput very dark mummy brown, broad postocular bars shining blackish brown. Pronotum very dark mummy

brown, lateral lobes with dorsal half shining blackish brown to principal sulcus, below this prout's brown, shading dorsad in metazonal portion to mummy brown. Dorsal surface of abdomen cinnamon brown, very heavily and broadly suffused laterad on proximal tergites with shining blackish brown, small exposed portion of eighth tergite of this color and distal portions of cerci darkened. Cephalic and median limbs buckthorn brown, except the dorsal surfaces of the femora which are very dark mummy brown. Caudal femora cinnamon brown, with proximal median, distal and genicular areas of very dark mummy brown in the characteristic Melanoplid pattern, the darker areas very heavy; ventral surface dragons-blood red (brazil red in the most brilliant examples), paling to light coral red on the internal face dorsad, with a narrow pregenicular buffy annulus and the internal face with three large heavy suffusions of liver brown dorsad. Caudal tibiae gobelin blue, the spines black, the spurs buffy, black tipped, the tarsi buffy.

Slight recession from the described type is shown, except in the females from High Creek among which a strongly recessive type is developed. In these the general coloration is walnut brown and burnt umber, the postocular bar alone darker, the color pattern weaker. The caudal femora have the ventral surfaces bittersweet orange, while the caudal tibiae are glaucous blue.

Specimens Examined: 70; 16 males, 53 females and 1 immature individual.

California: Santa Ana Canyon, San Bernardino Mountains, 6500 feet, VII, 25, 1906, (J. Grinnell), 1 ♀, [A. N. S. P.]. South Fork of Santa Ana River, San Bernardino Mountains, 6200 feet, VII, 6, 1906, (J. Grinnell), 1 ♀, [A. N. S. P.]. High Creek, south flank of San Gorgonio Peak, San Bernardino Mountains, 9000 feet, VIII, 29, 1919, (Rehn and Hebard), 3 ♂, 13 ♀. Vivian Creek, south flank of San Gorgonio Peak, San Bernardino Mountains, 7200 feet, VIII, 29, 1919, (Rehn and Hebard), 7 ♂, 35 ♀, 1 juv., *type, allotype* and *paratypes*. San Jacinto Peak, San Jacinto Mountains, 7000 to 10,000 feet, VIII, 20, 1914, (J. C. Bradley), 5 ♂, 4 ♀, [Cornell Univ., A. N. S. P. and Hebard Clns.].

At Vivian Creek the species was found rather abundant in the thin, dry and rather scanty grassy ground-cover in a ravine forest of massive conifers. At High Creek it was less abundant in a more open meadowy ravine, heavily carpeted with richer grasses, surrounded by a conifer forest of smaller trees than at Vivian Creek, and immediately above which the forest of Lodgepole Pines began, extending upward to timber line. We do not believe that the distribution of the species extends into that forest, in which the undergrowth is very scanty and grasses practically absent.

Melanoplus olamentke[28] new species (Plate XVII, fig. 11.)

This species is a member of the Lepidus Group, to which we refer Scudder's two Californian species, *lepidus* and *ablutus*. It is the least specialized of the three, showing nearest agreement with the Sierran *lepidus*.

Compared with males of that species, males of *olamentke* differ in the strength of the median carina of the pronotal disk which is heavy on the prozona, the more evenly rounded tegminal apices, the shorter and heavier caudal femora, the more simple male supra-anal plate, the narrower distal portion of the male cerci and in the male subgenital plate being much shorter and not produced meso-distad.

Type.— ♂; Southern Sonoma County, California. December 4, 1910. (J. A. Kusche.) [Hebard Collection, Type no. 556.]

Size and form medium, as in *lepidus*. Head as in *lepidus*, vertex little produced, sulcus of vertex and frontal costa moderately deep, interrupted briefly between lateral ocelli. Eye as in *lepidus*, large, over twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina strongly developed on metazona and on prozona to first transverse sulcus, transverse sulci weak, caudal margin of pronotal disk weakly obtuse-angulate produced. Prosternal spine as in *lepidus*, elongate conical with rounded apex. Tegmina shorter than pronotum, slightly overlapping, broad oval and differing from *lepidus* in having the apices more evenly rounded, showing no trace of the sublanceolate condition normal in that species. Furcula shorter than in *lepidus*, represented by a pair of minute rounded projections about as long as broad. Supra-anal plate shield-shaped, medio-longitudinal sulcus well developed with marginal carina on each side strongly defined in proximal two-thirds, disto-lateral carinae short, not strongly developed, not following the trend of the lateral margins, these latter simple, not specialized opposite cereal bases. Cerci slightly over twice as long as proximal width, ventral margin nearly straight, dorsal margin strongly though broadly concave mesad, thence strongly though broadly convex to the apex, which is situated ventrad at the juncture of this margin with the ventral margin, the cercus as a result with median portion slightly over half as wide as proximal portion and distal portion slightly wider than median portion. Subgenital plate less ample than in *lepidus* and not produced, median width equal to lateral width, free margin not raised mesad but showing a transverse thickening in that section.

[28]The division of the Moquelumnan Indians which once inhabited the region from which this species is known.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Type	16	4	2.3	3.8	2.1	9
Paratype	16.5	4	2.4	3.9	2.6	9.3

Coloration similar to that of *lepidus*. Head light brownish olive, deepening to sepia on occiput, with a weak postocular dark bar on each side. Antennae warm sepia. Pronotum with disk bister, lateral lobes with a broad shining blackish brown band dorsad to principal sulcus, below this saccardo's umber shading into bister on the dorsal portion of the metazonal section. Tegmina bister. Abdomen above snuff brown, the proximal segments broadly suffused on each side with shining blackish brown; ventral surface cinnamon-buff, becoming pinkish cinnamon distad. Cephalic and median limbs externally bister, internally paler. Caudal femora with pattern characteristic of many Melanopli rather strongly defined in blackish brown and tawny-olive, ventral portion of internal surface and entire ventral surface hay's russet. Caudal tibiae deep bluish gray-green, the spines black except at bases.

In addition to the type, a single paratypic male is before us, bearing the same data, the property of the California Academy of Sciences.

Melanoplus viridipes eurycercus new subspecies (Plate XVI, figs. 9 and 10.)

1903. *Melanoplus viridipes* Blatchley, Orth. of Indiana, p. 305. [♂, ♀; Marion County, Indiana.][29]

1906. *Melanoplus viridipes* Morse, Psyche, XIII, p. 135. [♂; North Adams, Massachusetts.]

1920. *Melanoplus viridipes* Morse, Manual Orth. New Eng., p. 522. (Except figures.)

1920. *Melanoplus viridipes* Blatchley, Orth. Northeastern Amer., p. 365. (In part.)

McNeill's record from Bloomington, Monroe County, Indiana, is apparently quoted by Blatchley in his studies of 1903. A single female from McNeill from that locality is before us, and we are therefore unable to assign the record definitely. It is probable, however, that it applies to the present race, from what we know of its distribution.

[29]The cerci are missing in the only male before us from this locality. The record, as a result, cannot be assigned, except from the probability indicated by the geographic position.

Of the other older records of *viridipes* and "*viridulus*," all apply to typical *viridipes* (plate XVI, figs. 11 and 12) except Lugger's state record for Minnesota, which was very possibly based upon an intermediate condition, such as we have from Wisconsin.

This geographic race agrees closely with typical *viridipes*, differing principally in the male cerci being heavier, shorter and taper distad, with apex bluntly rounded.

From over the wide range of this species eastward from Lake County, Indiana, not a single male before us shows a cercal development intermediate in character between the typical condition of *v. eurycercus* and that developed in *v. viridipes*, and we unhesitatingly describe this interesting geographic race. The race *v. viridipes* is similarly constant over a large portion of Illinois and some of the adjacent regions, as is demonstrated by very large series before us, in large part loaned by the Illinois State Laboratory of Natural History.[30]

[30]In his "Orthoptera of Northeastern America" Blatchley has treated *viridipes* and its allies in a particularly superficial and unsatisfactory manner. Of the distinct though closely related species described by Morse, he has synonymized *deceptus* and *similis* under *viridipes*. The hasty examination of types and other historic material, without effort being made to secure additional evidence, has caused Blatchley's work to fall far below the standard requisite in contemporary studies, particularly in groups such as the present, where forms occur having differences between them which cannot be valued accurately without thorough investigation.

That author's failure to comprehend or recognize geographic races is difficult to understand, but when we consider that he published on the present problem without effort to study, let alone see or compare, the large Illinois and eastern series available, we are not surprised that the conclusions are incorrect. If time for compilation of so large a work, having "ever in mind the needs of the tyro and not those of the specialist," alone was available, it is much to be regretted that the author's desire for revision was not curbed. Many nomenclatorial changes were made, based on what may well be termed snap judgments, which sadly lack the substantial backing to be gained by thorough analyses and comparisons of a reasonable amount of material. We are well aware that little more than a cursory examination of the historic specimens involved was attempted, though the resultant findings often blandly contradict the published conclusions of others, which had been reached only after years of constant study, building little by little toward a substantial and scientific knowledge of the Orthoptera of North America.

It is of interest to note that an intermediate condition occurs in material from Polk County, Wisconsin, showing nearer agreement with typical *viridipes;* while the males before us from Ann Arbor, Michigan, are also intermediates, referable to *v. eurycercus*, but showing distinct variation toward *v. viridipes.* In Indiana, however, the area of intergradation between the races is best demonstrated, as Blatchley has taken material of the species from a large number of localities. In the material before us from that state, males from Vigo and Tippecanoe Counties are typical *v. viridipes;* one from Fountain County and one from Vigo County are slightly atypical *v. viridipes;* intermediates are from Vigo and Lake Counties, while males from Fountain and Marion Counties are typical *v. eurycercus.*

It is apparent that the races intergrade in Indiana over the western section of the state, a certain amount of interdigitation occurring, *v. viridipes* sometimes pushing in from the west and *v. eurycercus* from the east.

Type.—♂; Derrick City, McKean County, Pennsylvania. June 6, 1915. (Wm. T. Davis.) [Hebard Collection, Type no. 563.]

Agrees closely with *v. viridipes*, differing only in the form of the cerci.[31] Cerci moderately stout, curved inward distad, approximately twice as long as basal width, lateral margins almost straight and very feebly convergent to distal third, where the convergence becomes stronger to the broadly rounded apex; external surface of distal third showing a weak longitudinal depression.

Allotype.—♀; same data as type. [Hebard Collection.]

This sex can not be distinguished from females of *v. viridipes.* In the regions where the races interdigitate, males taken at the same time as the females are necessary for determination.

[31]As described by Scudder (Proc. U. S. Nat. Mus., xx, p. 256, (1897)). Blatchley's first description of the cercus of *viridipes* (Orth. of Indiana, p. 305, (1903)) is apparently drawn from intermediate material which he had before him.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
Great Barrington, Massachusetts (7)	16.2–17.2	4–4.1	2.2–2.4	4.8–5.2	2.3–2.3	8.7–9.2
Derrick City, Pennsylvania, *type*	17	4.2	2.3	5	2.4	9.4
Derrick City, Pennsylvania, *paratypes* (32)	16.8–18.3	4–4.2	2.3–2.4	4.5–5	2.3–2.5	9–9.3
Sounding Knob, Virginia (2)	16–17.5	4–4.2	2.2–2.3	4.4–5.7	2–2.7	9.2–10
Cincinnati, Ohio	18.8	4.8	2.7	6	2.7	10.2
Marion County, Indiana (10)	16.5–19.5	4.2–4.6	2.4–2.8	4.9–6	2.4–2.9	9.7–10.2
♀						
Great Barrington, Massachusetts	21	4.7	3.2	5.4	3	10.2
Derrick City, Pennsylvania, *allotype*	21	5	3.6	5.1	3.3	10.8
Derrick City, Pennsylvania, *paratypes* (33)	19.4–22	4.6–5	3.1–3.6	4.2–5.8	2.4–3	9.4–11
Sounding Knob, Virginia (2)	22.8–22	4.6–4.9	3.6–3.2	5.3–5.4	3.1–2.8	10.8–10.9
Marion County, Indiana (10)	22.2–24.3	5–5.6	3.5–3.8	5.8–6.3	3.5–3.8	12–12.2

Not only does the series from Marion County, Indiana average somewhat larger in individual size than any other, but the greatest recession in color pattern is also shown.

In the series of paratypes the cerci show the following variation, the general type, however, remaining distinctive. Length ranging from one and three-quarters to two and one-quarter times proximal width. Apex ranging from very blunt to rather sharply rounded, median to meso-ventral in position. Ventral margin occasionally showing a very broad concave curvature distad. Depression of external surface distad subobsolete to rather strongly defined. The contour of the cereus often shows slight irregularities and in a single individual the cerci are rarely somewhat asymmetrical, one being slightly longer than the other or having the apex narrower.

In the eastern series a single specimen is before us, from North Adams, Massachusetts, the cerci of which may be considered atypical in character,

though showing more strongly the *v. curycercus* type. In this individual the length of these appendages is two and one-third times the basal width, the lateral margins showing weak convergence in the distal two-thirds to the rather broadly rounded distal portion, with apex meso-ventrad. The greatest cercal abbreviation is found in the two males from Sounding Knob, Virginia, in which the length of these appendages is but one and one-third times the basal width.

The apical tuberculation of the subgenital plate in males varies in degree of development, though usually prominent and sharply rounded. Rarely it is divided, giving to the subgenital plate of such individuals a bituberculate appearance.

In coloration full agreement with typical *viridipes* is shown, except that the caudal femora exhibit an average more intensive pattern. The two transverse bars are heavier, running from their origin in the dorsal portion of the internal surface across the dorsal surface and obliquely across the external surface, there fusing at the lower margin of the pagina.[32] This is not a constant feature, some series showing a distinctly more intensive pattern than others. The Marion County, Indiana series shows extreme recession, the caudal femoral markings being subobsolete in some males and the majority of females. The specimens from Cincinnati, Ohio; White Sulphur Springs, West Virginia, and Sounding Knob, Virginia show the maximum of color intensification.

Specimens Examined: 121; 70 males, 40 females and 11 immature individuals.

Vermont: St. Albans, VI, 21, 1913, (C. W. Johnson), 3 ♂, 1 ♀, [Morse Cln.].

Massachusetts: Great Barrington, VI, 15 and 16, 1915, (C. W. Johnson), 7 ♂, 1 ♀, [Morse Cln.]. Cascade, North Adams, 1100 to 1400 feet, foothills of Mt. Greylock, VI, 14, 1915, (C. W. Johnson), 1 ♂, [U. S. N. M.]. One mile above Bashbish Falls, VI, 27, 1912, (C. W. Johnson), 1 ♂, [Davis Cln.].

New York: Groton, VI, 11, 1914, (E. A. Chapman), 1 ♂, 3 ♀, [Davis Cln.]. Mix Creek Valley, Cattaraugus County, VI, 11, 1915, (Davis and Bradley), 2 ♂, 1 ♀, [Davis Cln.]. Rock City, Cattaraugus County, VI, 6, 1915, (Davis and Bradley), 1 ♀, [Davis Cln.]. Seneca Junction, VI, 7, 1915, (W. T. Davis), 2 ♀, [Davis Cln.]. Ithaca, 1 ♀, [Hebard Cln.]. West Danby, V, 30, 1915, (W. T. Davis), 1 ♂, [Davis Cln.].

Pennsylvania: Derrick City, VI, 6, 1915, (W. T. Davis), 32 ♂, 22 ♀, *type, allotype* and *paratypes,* [Davis, Hebard and Fox Clns.]. Ligonier, Westmoreland County, V, 23, 1905, (G. Brugger), 1 ♂, 1 juv. ♂, 1 juv. ♀, [A. N. S. P.].

Maryland: Jennings, Garrett County, VI, 24, 1907, (B. Long), 1 ♂, 1 ♀, [A. N. S. P.]. Near Jennings, Garrett County, 3000 feet, VI, 25, 1907, (B. Long), 2 ♀, [A. N. S. P.].

[32]In the series of eighty-seven specimens of typical *viridipes* before us, not a single case occurs of the fusing of these bars ventrad on the external face of the caudal femora.

Virginia: Sounding Knob, Highland County, 3800 and 4200 feet, VIII, 21, 1916, (M. Hebard), 2 ♂, 2 ♀, [Hebard Cln.]. Tazewell, Tazewell County, VI, 9, 1915, (L. O. Jackson), 1 ♂, 1 ♀, [U. S. N. M.].

West Virginia: White Sulphur Springs, VII, 2, 1919, (W. T. Davis), 2 ♂, [Davis Cln.].

Ohio: Cincinnati, VI, 24, 1904, 1 ♂, [Blatchley Cln.].

Indiana: Marion County, VI, 1 to 5, 1900, 1902 and 1904, (W. S. Blatchley), 10 ♂, 10 ♀, [Blatchley, Morse and Hebard Clns., A. N. S. P. and U. S. N. M.]. Bloomington, Monroe County, VI, 11, 1886, (J. T. McNeill), 1 ♀,[33] [Hebard Cln.]. Monroe County, (W. S. Blatchley), 1 ♂,[34] [Blatchley Cln.]. Vigo County, VII, 5, 1892, (W. S. Blatchley), 1 ♂, [Blatchley Cln.].

Atypical *viridipes eurycercus.*

Specimens Examined: 11; 6 males, 4 females and 1 immature individual.

Indiana: Lake County, VI, 20, 1899, (W. S. Blatchley), 3 ♂, 1 ♀, [Blatchley and Univ. Minn. Clns.]. Vigo County, V, 16, 1904, (W. S. Blatchley), 1 ♂, [Blatchley Cln.].

Michigan: Ann Arbor, V, 28, 1918, (T. H. Hubbell), 2 ♂, 3 ♀, 1 juv. ♀, [A. N. S. P.].

Wisconsin: Polk County, VII, (C. F. Baker), ♂, [A. N. S. P.].

Intermediate between *viridipes viridipes* and *viridipes eurycercus*

Specimens Examined: 3; 3 males.

Indiana: Vigo County, V, 16, 1904, (W. S. Blatchley), 1 ♂, [Blatchley Cln.]. Fountain County, 1907, (W. S. Blatchley), 1 ♂, [Blatchley Cln.].

Wisconsin: Polk County, VII, (C. F. Baker), 1 ♂, [A. N. S. P.].

In the Appalachian Mountains this insect apparently frequents mountain meadows near the forests. In such an environment specimens, from their condition apparently the last of the season, were taken on Sounding Knob in Virginia.

We are told by Davis that he found the race very common at Derrick City, Pennsylvania. In life, as he states, the colors are bright and give individuals a most pleasing appearance. He found that "they climbed up on old stumps of trees and were running over the carpet of old leaves and the lesser woodland plants in every direction. They were moderately active, though it is true that the series was collected without much trouble."

From Blatchley's records, we learn that the series from Marion County, Indiana, was secured in upland woods.

[33] Without males from this locality we cannot definitely assign this specimen, except from the probability indicated by geographic position.

[34] The cerci are missing in this specimen, which as a result cannot be definitely assigned, except from the probability indicated by geographic position.

The insect is local in distribution, being found in colonies, and is in consequence more liable to be overlooked by the collector than the more generally distributed forms. The fact that it is a spring form further explains why, though so widely distributed, the species is poorly represented in most collections. The number of localities represented, and large series of specimens in the Davis Collection, again gives excellent evidence of the thorough and specialized field methods of our able friend.

Melanoplus calloplus new species (Plate XVI, figs. 13 and 14.)

The present species is a member of the Gracilis Group, showing an annectant type between *M. similis* Morse and *M. viridipes* Scudder.

Compared with *similis* it is separated by the shorter tegmina, barred caudal femora[35] and distinctive male cerci, which are bicolored, much less slender in distal half, widen there and are rather broadly truncate at the apex.

Like *similis*, this species has a slightly but appreciably smoother general facies than *viridipes*. In *calloplus* the pale and dark markings are usually somewhat more contrasted than is normal in *viridipes*, the markings of the caudal femora not as heavy or dark as is usual in that species, while the male cerci are of a distinct type.

Type.—♂; Collison Ridge, Bath County, Virginia. Elevation, 3200 feet. July 5, 1916. (M. Hebard.) [Hebard Collection, Type no. 553.]

Size, form and general structure as in *viridipes*. Fastigium of vertex and frontal costa similar but slightly more sulcate, the former with lateral margins weakly but distinctly rounded carinate.[36] Antennae as in *viridipes*, fully twice as long as pronotum. Eye slightly longer than cheek[37] nearly twice as long as the infra-ocular sulcus. Pronotum much as in *viridipes*, the percurrent medio-longitudinal carina weak, cut only by the principal sulcus;[38]

[35]In occasional females of this species, as well as of *viridipes*, these usually conspicuous markings are subobsolete or wholly absent.

[36]In *viridipes* these margins are usually very weakly carinate, material from the Virginia Mountains of that species, however, showing variation toward the type described above.

[37]Averaging very slightly longer in *viridipes*.

[38]In *viridipes* the medio-longitudinal carina of the pronotum is sometimes cut by all three sulci or is sometimes subobsolete cephalad; it is normally cut by all but the first sulcus. Larger series of *calloplus* will probably show similar variation.

caudal margin of disk very weakly obtuse-angulate produced. Tegmina overlapping as in *viridipes*, slightly longer than pronotum, ovate, with apex broadly rounded. Wings greatly atrophied, but retaining the characteristic folding of the radiate field. Prosternal spine small, blunt conical. Furcula as in *viridipes*, represented by two minute projections, the areas from which they spring perceptibly thickened and separated by a broad angulate emargination. Supra-anal plate as in *viridipes*, shield-shaped, slightly longer than basal width, with a decided medio-longitudinal sulcus in proximal half, lateral portions broadly concave, distal portion slightly raised and very weakly concave, bounded laterad by the rounded parallel disto-lateral carinae. Cerci slightly over twice as long as proximal width, tapering gradually in proximal half to narrowest point, where it is half as wide as the basal width, thence expanding slightly, the convexity of the dorsal margin slightly the greater, to the rounded distal angles; rather broadly truncate, weakly oblique at apex.[39] Subgenital plate small, tapering to the distinct apical tubercle, which is twice as broad as thick.[40]

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Similar to females of *viridipes*, differing in the slightly more sulcate fastigium of vertex and frontal costa, with lateral margins slightly more distinct, as described for the male type of this species. Differing from the male in the larger size, more robust form and (usually[41]) more ample tegmina. Prosternal spine short and heavy, very blunt conical. Ovipositor valves as in *viridipes*, moderately elongate, the dorsal pair with distal curvature weak, the ventral pair with such curvature very weak.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
West Point, New York (3)	17–17.5	4–4.1	2.3–2.4	4.8–5.6	9.6–9.7
Collison Ridge, Virginia, *type*	17.5	4.6	2.7	5.1	9.7
Collison Ridge, Virginia, *paratypes*, (5)	15.8–17.5	4.2–4.3	2.4–2.8	4.8–5	9.4–10
White Sulphur Springs West Virginia, (2)	16–16.8	4–4.2	2.4–2.6	5–4.8	6.2–9.6

[39]Slight variation in the length and degree of narrowing as well as in the arcuation of the margins of the cerci is shown by the males before us; the type, however, being readily recognizable.

[40]In one paratype slight bituberculation is shown.

[41]Decided tegminal size variation is shown by the series before us.

♀	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
West Point, New York (4)	23–24	4.9–5	3.3–3.3	5.3–6.2	10.2–11.3
Plainfield, New Jersey	22.7	4.9	3.2	5.7	11.2
Collison Ridge, Virginia, *allotype*	23.8	5.3	4.4	5.4	11.8
Collison Ridge, Virginia, *paratypes*	21–25.5	5–5.3	3.2–3.7	4.8–5.8	11–12
Snickers Gap, Virginia	24.5	5.2	3.9	6.4	11.9
White Sulphur Springs, West Virginia	26.3	5.8	3.5	6.2	12.3

Coloration similar to that occasionally developed in *viridipes*, differing from the usual in that species as discussed above in the preliminary comparison.

Male. Head reed yellow, occiput brownish olive, a broad shining black postocular bar on each side, eyes and antennae cinnamon brown. Pronotum with disk brownish olive, lateral lobes in dorsal section (three-fifths of greatest depth) shining black, remaining portions ivory yellow. Tegmina immaculate brownish olive. Abdomen isabella color dorsad, chamois ventrad, the penultimate sternite tipped with shining black, the entire subgenital plate shining black except in subchitinous portion. Cerci shining black except for a quadrate dorso-proximal area of chamois. Cephalic and median limbs olive-yellow, fading on median femora proximad to olive-ocher. Caudal femora olive-ocher, showing two broad transverse dorsal bands of prout's brown which, on the external face, run obliquely cephalad to the median line, entire genicular area blackish, the paler area before this often tinged with green. Caudal tibiae clear light yellowish olive, with a small black basal annulus; the spines black, the spurs buffy with black tips.

Female with less contrasting but similar coloration. Head tawny shading to buff, tinged with tawny on genae and dark cinnamon-brown on occiput, broad postocular bars shining blackish brown, eyes prout's brown, antennae cinnamon brown. Pronotum with disk cinnamon brown, this continued on the dorsal portions of the lateral lobes, that area frequently shining blackish brown along the ventral margin and cephalad; lower two-fifths of lateral lobes buffy, weakly tinged with tawny. Tegmina immaculate prout's brown. Abdomen ochraceous-tawny dorsad, suffused with cinnamon-brown, ventral surface weak yellow ocher. Cephalic and median limbs mars brown, the femora with a greenish tinge. Caudal femora dorsad vinaceous-tawny with two broad transverse bars of mars brown (individually varying from weak to well defined), these scarcely traceable on the russet to pecan brown external face; genicular lobes, laterad only, blackish with genicular areas brown.

Caudal tibiae dark olive buff becoming brownish buff proximad and distad, with a small black annulus near base.

Specimens Examined: 29; 13 males and 16 females.

New York: West Point, VI, 14, 1914, (W. T. Davis), 4 ♂, 7 ♀, [Davis Cln.].

New Jersey: Plainfield, VIII, 4, 1907, (W. T. Davis; on ridge to west of town), 1 ♀, [Davis Cln.].

Virginia: Collison Ridge, Bath County, 3200 feet, VII, 5 and 8, 1916, (M. Hebard), 6 ♂, 5 ♀, *type, allotype* and *paratypes*, [Hebard Cln.]. Snickers Gap near Bluemont, V, 28, 1914, (W. T. Davis), 1 ♀, [Davis Cln.].

West Virginia: White Sulphur Springs, VII, 2 and 3, 1919, (W. T. Davis), 2 ♂, 1 ♀, [Davis Cln.].

Tennessee: Mayland, Cumberland Plateau, Cumberland County, VI, 9, 1920, (S. Markovitch, in sylvan surroundings), 1 ♂, 1 ♀, [Hebard Cln.].

During the summer of 1916, the author collected constantly in the vicinity of Hot Springs, Virginia. The mountain ridges in this region are numerous and all but the highest are covered with heavy deciduous forests. On one of these, Collison Ridge, the typical series was taken at 3200 feet, just below the summit of the ridge, at its southwestern extremity, on the eastern slope. One small colony was found on July 5, when an intensive search was made. On July 8 this was repeated, four more individuals being secured in the original spot and close by in another similar area. For a month from this date we were constantly on the lookout for this species, no others being found at the original spot or elsewhere. The series was secured in the forest undergrowth of mountain laurel, huckleberry and other knee-high to waist-high bushes. The males were the more active, remaining up in the bushes and slipping through them rapidly, or springing from twig to leaf, but never to the ground.

We believe *calloplus* to be a thanmophilous sylvan species, occurring in widely scattered colonies. It may well be termed a late spring form, appearing adult probably earlier than the great majority of the Melanopli.

EXPLANATION OF PLATES

PLATE XVI

Fig. 1.—*Oedaleonotus borckii orientis* new subspecies. Lateral view of male (*type*). (×3)

Fig. 2.—*Bradynotes albida* new species. Cercus of male (*type*). (Greatly enlarged.)

Fig. 3.—*Bradynotes albida* new species. Dorsal view of female (*allotype*). (×3)

Fig. 4.—*Bradynotes excelsa* Rehn. Cercus of male (*type*). Mount Tyndall, California, 12,000 feet. (Same scale as fig. 2.)

Fig. 5.—*Melanoplus splendidus* new species. Cercus of male (*paratype*). (Greatly enlarged.)

Fig. 6.—*Melanoplus splendidus* new species. Lateral outline of distal portion of abdomen of male (*paratype*). (×8)

Fig. 7.—*Melanoplus splendidus* new species. Lateral view of female (*allotype*). (×2)

Fig. 8.—*Melanoplus rehni* new species. Lateral view of pronotum of female (*allotype*). (×3)

Fig. 9.—*Melanoplus viridipes euryeercus* new subspecies. Lateral view of caudal femur of male (*type*). (×3½)

Fig. 10.—*Melanoplus viridipes euryeercus* new subspecies. Cercus of male (*type*). (Greatly enlarged.)

Fig. 11.—*Melanoplus viridipes viridipes* Scudder. Lateral view of caudal femur of male. Muncie, Illinois. (×3½)

Fig. 12.—*Melanoplus viridipes viridipes* Scudder. Cercus of male. Muncie, Illinois. (Same scale as fig. 10.)

Fig. 13.—*Melanoplus calloplus* new species. Lateral view of caudal femur of male (*type*). (×3½)

Fig. 14.—*Melanoplus calloplus* new species. Cercus of male (*type*). (Same scale as fig. 10.)

PLATE XVII

Fig. 1.—*Melanoplus cumera* new species. Lateral view of female (*allotype*). (×2)

Fig. 2.—*Melanoplus platyeercus* new species. Dorsal view of distal portion of abdomen of male (*type*). (About ×11)

Fig. 3.—*Melanoplus platyeercus* new species. Cercus of male (*type*). (Greatly enlarged.)

Fig. 4.—*Melanoplus platyeercus* new species. Dorsal view of female (*allotype*). (×3)

Fig. 5.—*Melanoplus rehni* new species. Cercus of male (*type*). (Greatly enlarged.)

Fig. 6.—*Melanoplus orcophilus* new species. Lateral outline of distal portion of abdomen of male (*type*). (×9)

Fig. 7.—*Melanoplus orcophilus* new species. Lateral view of female (*allotype*). (×3)

Fig. 8.—*Melanoplus calapooyae* new species. Dorsal view of male supra-anal plate (*type*). (×13)

Fig. 9.—*Melanoplus bernardinae* new species. Dorsal view of male supra-anal plate (*type*). (×17)

Fig. 10.—*Melanoplus bernardinae* new species. Lateral outline of distal portion of abdomen of male (*type*). (×10)

Fig. 11.—*Melanoplus olamentke* new species. Lateral outline of distal portion of abdomen of male (*type*). (×9)

PLATE XVIII

Fig. 1.—*Melanoplus cumera* new species. Cercus of male (*type*). (About ×15)

Fig. 2.—*Melanoplus ponderosus ponderosus* (Scudder). Cercus of male. Sweetwater, Texas. (Same scale as fig. 1.)

Fig. 3.—*Melanoplus tunicae* new species. Lateral outline of distal portion of abdomen of male (*type*). (×8)

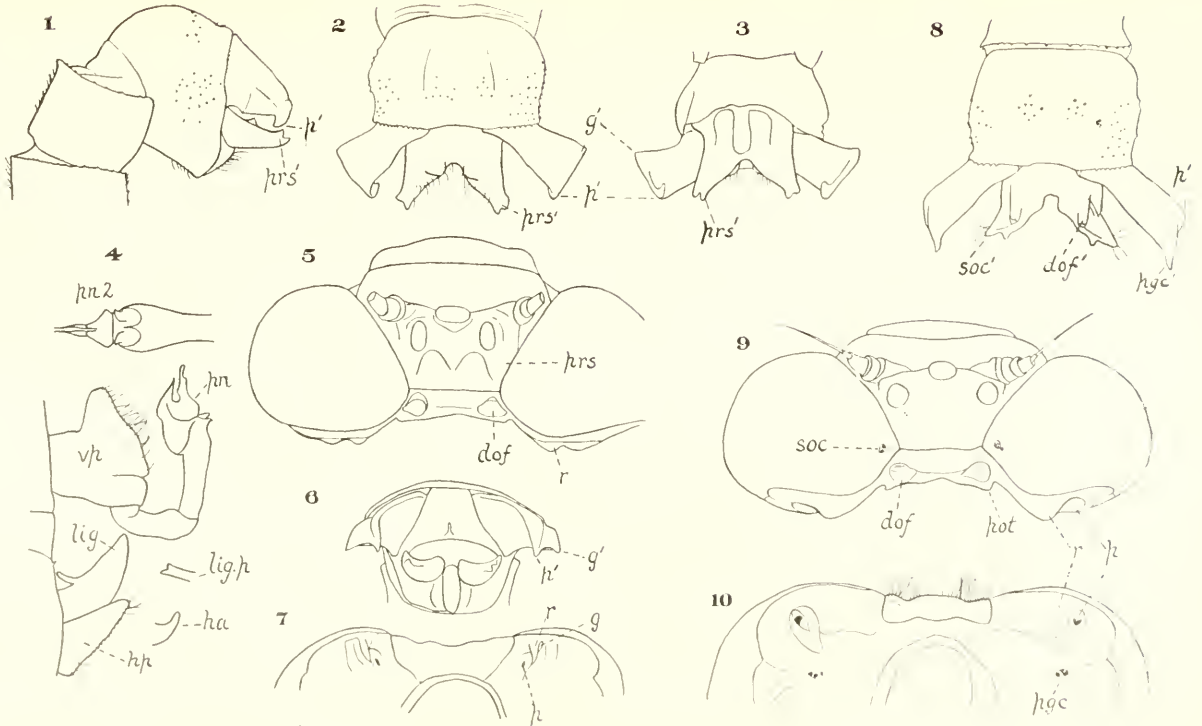
Fig. 4.—*Melanoplus tunicae* new species. Cercus of male (*type*). (Same scale as fig. 1.)

Fig. 5.—*Melanoplus ponderosus viola* (Thomas). Cercus of male. St. Louis, Missouri. (Same scale as fig. 1.)

Fig. 6.—*Melanoplus alabamae* new species. Lateral outline of distal portion of abdomen of male (*type*). (×8)

Fig. 7.—*Melanoplus alabamae* new species. Cercus of male (*type*). (Same scale as fig. 1.)

Fig. 8.—*Melanoplus calapooyae* new species. Cercus of male (*type*). (Greatly enlarged.)



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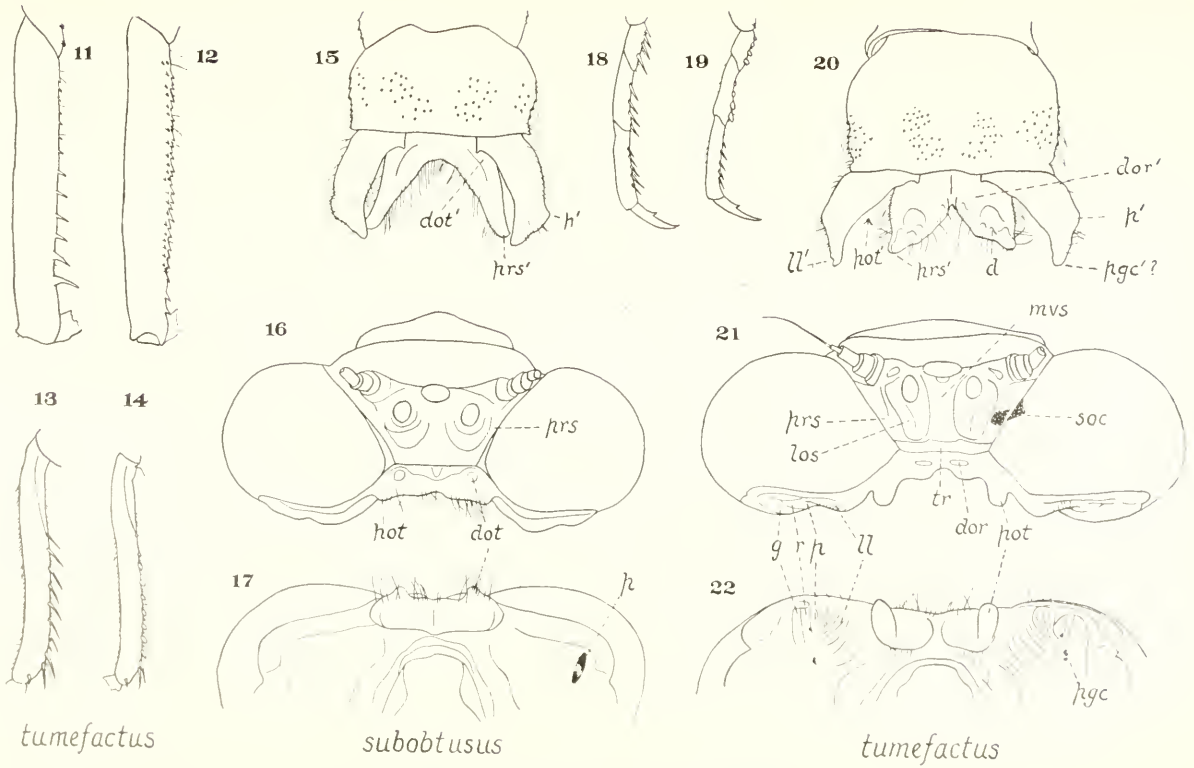

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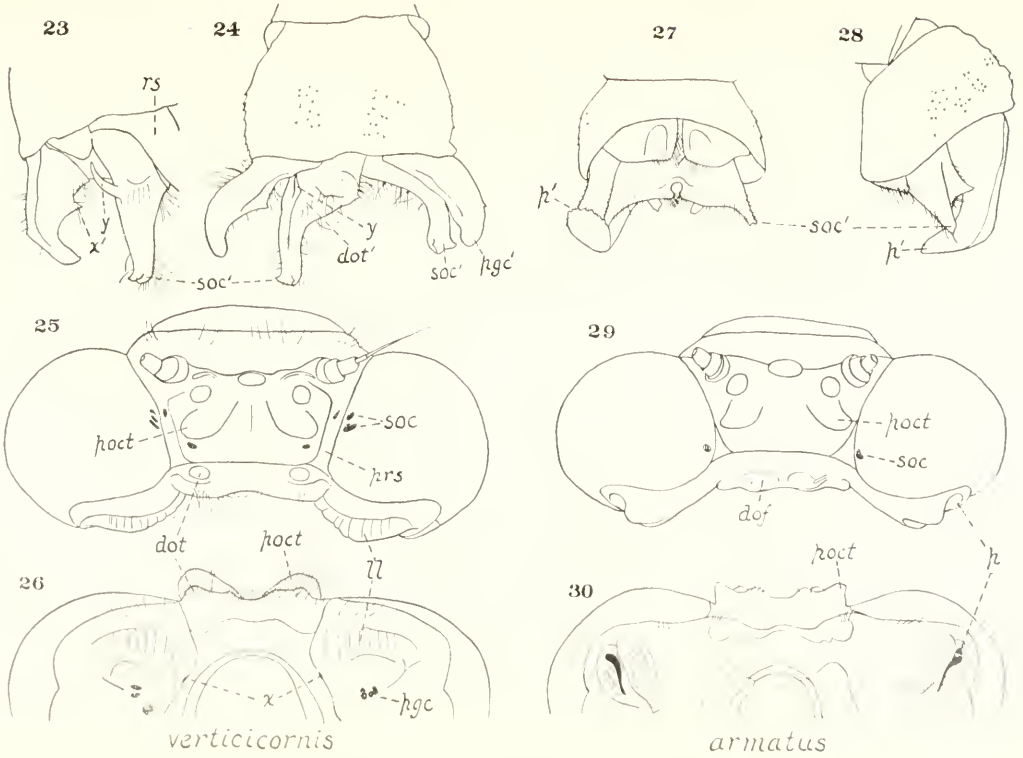

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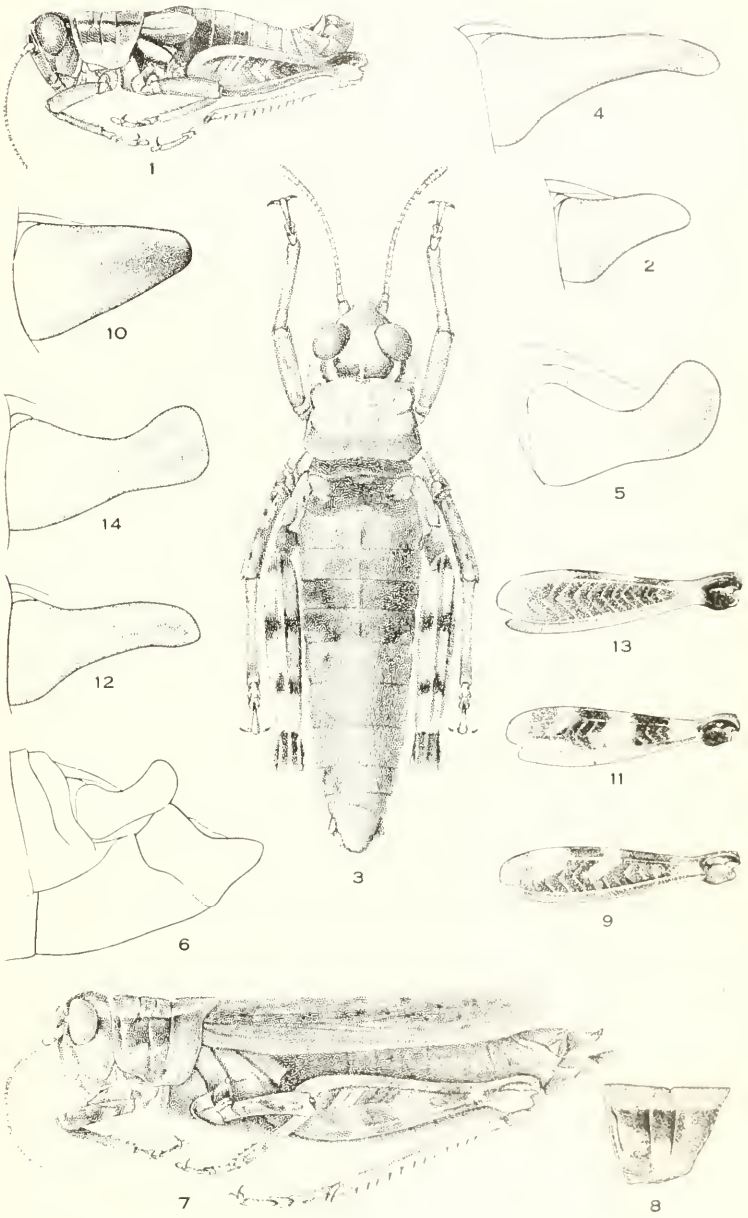
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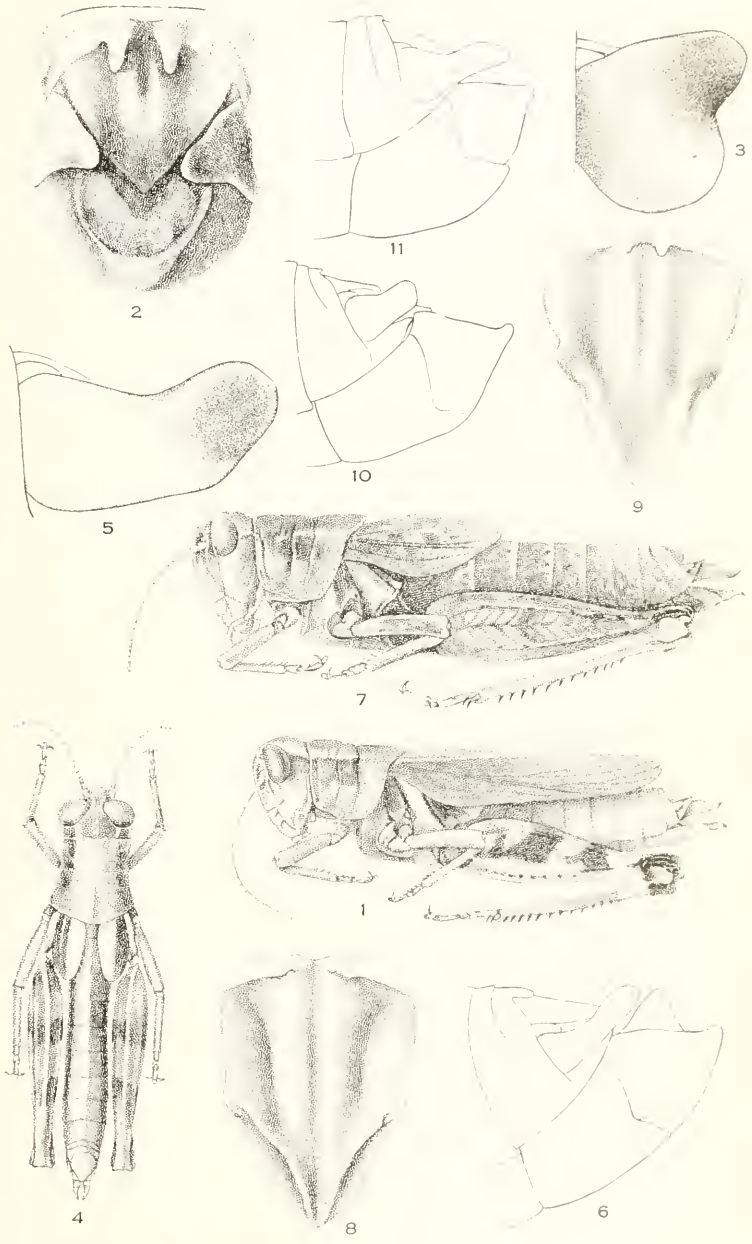
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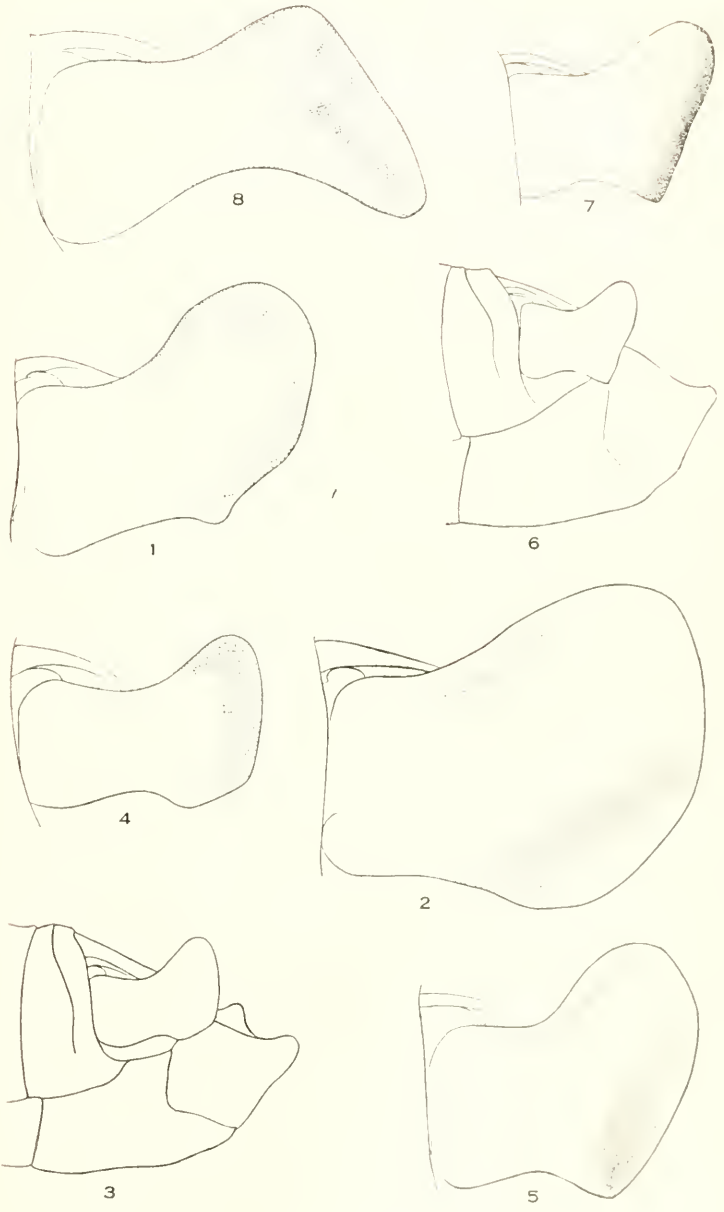
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